A STUDY ON PATIENTS' MEDICATION ADHERENCE AND PRACTICES WITH THEIR ORAL ANTICANCER AGENTS

Dissertation

Submitted to

The Tamil Nadu Dr. M.G. R. Medical University, Chennai.

In partial fulfillment for the award of the degree of

Master of Pharmacy

In

PHARMACY PRACTICE

By

Reg. No: 26113486

DEPARTMENT OF PHARMACY PRACTICE

ULTRA COLLEGE OF PHARMACY

4/235, COLLEGE ROAD, THASILDAR NAGAR,

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CERTIFICATE

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Dean (P.G Programme),
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INSTITUTIONAL ETHICS COMMITTEE

Proposal No : UCP/IEC/2012-2013/27 **Date : 03.01.2013**

This is to Certify that the Research proposal entitled "A study on patients' medication adherence and practices with their oral anticancer agents". Submitted by JOBU KURUVILLA M.Pharm., Pharmacy practice II year presented to the committee held on 03.01.2013 for approval. It was reviewed by the committee and was approved to be carried out as per the protocol.

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TO WHOMSOEVER IT MAY CONCERN

This is to certify that the dissertation entitled " A STUDY ON PATIENTS' MEDICATION ADHERENCE AND PRACTICES WITH THEIR ORAL ANTI-CANCER AGENTS" was carried out by JOBU KURUVILLA, 2nd year M.Pharmacy student of Ultra College of Pharmacy, Madurai, in the Outpatient Oncology Department of CARE HOSPITALS, HYDERABAD, ANDHRA PRADESH, for a period of 3 months, under my direct supervision and guidance to my fullest satisfaction.

Yours sincerely,

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HYDERABD

Morisky 8-Item Medication Adherence Questionnaire

Question	Patient Answer (Yes/No)	Score Y=1; N=0
Do you sometimes forget to take your medicine?		
People sometimes miss taking their medicines for reasons other than forgetting. Thinking over the past 2 weeks, were there any days when you did not take your medicine?		
Have you ever cut back or stopped taking your medicine without telling your doctor because you felt worse when you took it?		
When you travel or leave home, do you sometimes forget to bring along your medicine?		
Did you take all your medicines yesterday?		
When you feel like your symptoms are under control, do you sometimes stop taking your medicine?		
Taking medicine every day is a real inconvenience for some people. Do you ever feel hassled about sticking to your treatment plan?		
How often do you have difficulty remembering to take all your medicine? __ A. Never/rarely __ B. Once in a while __ C. Sometimes __ D. Usually __ E. All the time		A = 0; B-E = 1
	Total score	

Scores: >2 = low adherence
1 or 2 = medium adherence
0 = high adherence

Morisky DE, Green LW, Levine DM. Concurrent and predictive validity of a self-reported measure of medication adherence. *Med Care*. 1986;24:67-74.

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LIST OF ABBREVIATIONS

SL.NO.	ABBREVIATIONS	DESCRIPTION
1)	**AAL**	Acute Lymphoblasts Leukemia
2)	**AEs**	Adverse Events
3)	**CCNS**	Cell Cycle Non Specific
4)	**CCS**	Cell Cycle Specific
5)	**CDK**	Cyclin Dependent Kinase
6)	**DNA**	Deoxy ribo Nucleic Acid
7)	**IPSOC**	Investigating Patients Satisfaction with Oral anti-Cancer treatment
8)	**IV**	Intra Venous
9)	**MDI**	Metered Dose Inhalations
10)	**MEMS**	Medication Events Monitoring System
11)	**MMAS**	Morisky Medication Adherence Scale
12)	**MRCC**	Metastatic Renal Cancer Centre
13)	**OAD**	Oral Anti-cancer Drugs
14)	**PPI**	Patient Package Insert

DECLARATION

I hereby declare that this thesis work entitled **"A STUDY ON PATIENTS' MEDICATION ADHERENCE AND PRACTICES WITH THEIR ORAL ANTICANCER AGENTS"** submitted to The Tamil Nadu Dr. M.G.R Medical University, Chennai was carried out by me in the Department of Pharmacy Practice, Ultra College of Pharmacy, Madurai, under the valuable and efficient guidance of **Mr.T.REGUPATHI, M.Pharm, MLM, MBA.,** Prof & Head, Department of Pharmacy Practice, Ultra College of Pharmacy, Madurai during the academic year Nov 2012-Oct 2013. I also declare that the matter embodied in it is a genuine work and the same has not to formed the basis for the award of any degree, diploma, associateship, fellowship of any other university or institution.

PLACE: MADURAI (**Reg. No: 26113486)**

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.

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ADHEREN CE:

The terms compliance and adherence are used to express the concept of matching the patient behavior, attitude and actions in conformity with the suggestions, expectation or intensions of the treating physician. It is an action or process initiated and complete in accordance with a request, command, direction or instruction. The extent to which the patients do this is expressed by the term patient compliance which is an old term, widely used throughout the world. Other newer terms like "patient adherence", medication adherences were recommended in place of patient compliance in the recent past. Adherence to oral pharmacologic therapy is a complex and multi factorial issue that can substantially alter the outcome of therapy.[1].

Adherence has recently been defined by the international society for pharmacoeconomics and outcome research as the extent to which a patient acts in accordance with the prescribed interval and dose of a drug regimen. A patient is optimally adherent if no doses are missed, no extra doses are taken and no doses are taken in the wrong quantity or at the wrong time. Adherence is measured over a period of time and reported as the adherent rate, which is the percentage of dose taken in relation to what was prescribed. The present concept of adherent in its real sense envisages issues related to diet, lifestyle, exercise, rest, etc in addition to the use of medicines. However in pharmacy practice, patient adherence is seen frequently discussed from the point of view of drug therapy only. It is of great importance in the determination of therapeutic outcome. How patient take their medication is a crucial component of whether they will respond as expected.[2,3]

Measurement of adherence: [4,5]

There is no current golden standard measurement and all methods have limitations. The major limitation of measuring adherence is the so-called Hawthorne effect, i.e. the monitoring of adherence itself influences adherence; because the awareness of patient that adherence is being monitored may influence their behavior. Adherence rates for many chronic drug therapies range between 35% and 70%. The consequences of poor adherence are poor health outcome and increased health care cost. Proper diagnosis of the disease is essential for planning effective treatment.

Similarly detection of non adherence is an essential prerequisite for making the treatment effective. Like certain diseases, patient adherence or non adherence is a changing behavior and hence necessitates continuous monitoring. Apart from the on the spot observance and recording at the time of medication taking or treatment implementation, there is no specific or ideal method available to evaluate or detect patient compliance. Direct on the spot observation of the patient is not an always a practical method and hence many methods were suggested, though not ideal or perfect.

Current detection method of adherence includes direct methods and indirect methods. All these methods have their own limitations. None is fully dependable. Some rely on the honesty, integrity and dependability of the patient others are intrusive and are of only experimental values. The direct methods are believed to have a higher sensitivity and dependability compared to the indirect methods.[1]

DIRECT METHODS :[6,7,8]

The common direct methods to detect adherence are:-

1. Direct observation
2. Use of biological markers
3. Tracer compounds and assay of body fluids

Direct observation: Medicine adminis tration in homes and in hospitals could observe directly to confirm that the patient actually takes the medicine. Direct observation will help the patient to develop the skills to complain within certain cases like application of eye drops, and inhaler devices.

Measurements of blood levels of marker: biological marker and tracer compounds in small amounts are added to the medicines and given to the patient. Then the level of marker in the body is measured. This will indicate patient adherence. S mall amounts of tracer compounds with long half lives like low dose Phenobarbital are added to certain medicines and measured in biological fluids as pharmacological indicators of adherence. With knowledge of drug kinetics, an estimate of dosing can be done. It can g ive both quantitative and qualitative data.

There are many problems with this method. There is an ethical issue in this type analysis, both regarding safety and necessity. Moreover an invasion is needed to obtain samples for analysis.[9,10]

Measurement of blood or urine levels of drug: Determination of drug concentration in the patient's biological fluids will also help to measure the adherence. In the case of drugs like digoxin or phenytoin analysis of blood plasma will help to detect their presence. The drug concentration in the body fluid will not help to provide data regarding timing of medicines used.

INDIRECT METHODS; [11,12]

The currently available indirect methods include:

1) Self report and direct interview
2) Pill and container counts
3) Achievements of treatment goals
4) Mechanical and electronic devices

Self report and interview: self report by the patient and their interviews by the pharmacist are the simplest and widely used methods to measure or detect adherence. Studies have shown that even the most skilled and scientific interviewing often fails to estimate the adherence. Self report and interview have the limitation that they are predominantly subjective methods of evaluation. Some patients may deliberately indicate a poor level of adherence. The use of diaries by patients could help for prospective reporting and can give more information if done properly. It is difficult to sustain dairy keeping for long periods.

Pill and container counts: Counting of tablets, capsules etc, is a method originally introduced in clinical drug studies to measure adherence. It is based on the presumption that a patient's adherence with the medication regimen can be estimated based on counting of residual pills in the original container given to him. The advantage of th is method is that, it can be done even at home by a relative or friend of the patient. If it is done on a regular basis, the number or quantity of the items used during a particular period can be found and that can indicate the adherence. However, pill dumping is common practice in certain categories of patients. P ill dumping is the

discarding of the medicines in waste bins, wash basins and toilets, etc., by patients to misrepresent their adherence to health care professionals and family members.

Achievements of treatment goals: The theory of medicine teaches us that if a drug is administered correctly, there should be an observable outcome, an improvement in the condition of the patient. On certain occasions the achievement of treatment goals has been used as a measure of patient's adherence. Here the health outcome measures are used as indicators of adherence. But in certain cases like treatment of hypertension, diabetes, etc, patients may load upon medication just before their visit to hospital or doctor. This will help them to have a normal blood pressure or blood sugar at the time of investigation or checking, but the patient was not following the regime properly. This type of behavior is called "Tooth brush effect" and can invalidate the health outcome strategy either partly or totally.

Mechanical and electronic devices: Mechanical devices are first introduced in the eye drops where a chip was built in to its cap. The chip helps to record each inversion of the bottle, and is taken to indicate use. But the disadvantage is that even a deliberate or accidental turn will be counted.

NON- ADHEREN CE: [13,14]

If a patient not taking the medicines as recommended or not following the treatment schedule as suggested by the physician, he can be considered as non-adherent. Failure to follow and obey the instructions regarding healthcare including diet regimen, exercise and other lifestyle activities like smoking or drinking habits will also constitute for the non adherence. Non adherence includes poor adherence and defective adherence.

CAUSES OF NON ADHEREN CE: [1,15,16]

Drugs don't work if people don't take them. Medication is recommended to the patients to improve their health or cure their diseases. Available data shows that a large percentage of patients, for a variety of reasons, do not take their medications in the manner suggested, creating the problem of non adherence. It is true that some patients make a conscious decision to deviate from the prescribed

regimen (intentional non-adherence). Adherence is sometimes analyzed as attitudinal adherence and behavioral adherence. Sometimes the attitude and behavior of the patient may be incongruent. Patients may sincerely intend to their medicines exactly according to the instructions, but fail because they forgot or failed to understand the instructions. Different factors are responsible for non adherence. It may vary from patient to patient. Sometimes the patient may not like to take the medicines or may take not as directed but as per the decision of the patient himself.

Why patients become non adherent? : lack of belief in the treatment, complexity of the disease, multiple ailments, inability to pay for the medication, lack of awareness or information, multiple drug regimen, in convenient dosage times, administration difficulties, side effects, deliberate deviation from therapies due to factors like asymptomatic condition, symptomatic feelings of well being, fear of addiction or development of a new disease, etc, are some of the common reasons for non adherence.

Non adherence can lead to therapeutic failure, which in some cases results in serious complications or death. If an epileptic patient fails to take medicines there is every chance for the recurrence of epilepsy.

GENERAL FACTORS OF NON ADHERENCE:[1,17,18]

Numerous factors of various types can be suggested to contribute to patient non- adherence. Some of the more important and commonly considered factors are noted below.

1. **Type of disease or illness**: The nature or type of illness can sometimes contribute to non adherence. Psychiatric patients may not have the ability to cooperate with the treatment. Mentally disturbed patients may find adherence difficult. P hysical disabilities can make swallowing difficult if a tablet is too large. When the patients are asymptomatic or symptoms subside, it is difficult to convince the patient of the importance of drug therapy, if a patient feels better after taking the medicine he may also feel that he no longer needs to take, once the symptoms subside.

2. **Physical limitations**: many physical factors can affect the adherence. In certain cases distance can be a factor. The patient may have to travel a long distance to procure the medicine. Physical dexterity is required for the administration of some medicines as in the case of eye drops. The patient has to tilt his head, squeeze on a small bottle and aim accurately a small distance from the eye in order to successfully instill a drop in to the eye. Certain patients may find it difficult or impossible. Dosage forms like suppositories, pessaries, rectal creams, buccal tablets, etc., also require skills for proper administration. Very small tablets may cause handling problems for certain patients. Dysphagia, a difficulty in swallowing, is often a problem for many.
3. **Therapeutic regimen**: A drug regimen includes the dose, dosage form, route and frequency of administration, and duration of the therapy. It is often found that the more complex the therapeutic regimen, the less will be the adherence. The degree of non adherence is directly related to the complexity of the therapeutic regimen. Complex drug regimen, multiple drug therapy (polypharmacy) and frequent administration of medication naturally attract non adherence.
    a) **Multiple drug therapy**: As the number of medicines a patient has to take increases, the risk of non adherence also increases in direct proportion.
    b) **Frequency and duration of dosing**: The increase in frequency of administration of medication leads to non adherence due to various reasons like forgetting to take or inconvenience to take at the same time. It is always advisable to select medications that permit the lowest daily prescribed dose frequency for improving adherence.
    c) **Adverse effects**: When patients experience symptoms, which they attribute to adverse effects of the medicine, then unless they can be persuaded that the potential benefits of treatment outweigh the disadvantages, they will stop taking the medicines.
    d) **Cost of medication**: Cost of the medication is a factor for adherence or non adherence in many cases. In the case of costly items the adherence is more if the patient has purchased the items. In many cases, the patient may not be able to purchase costly items as they find them unaffordable. There are many reports of patients asking the pharmacist which is the more important item.

Sometimes the price factor will compel the patients to introduce "rationing" for their medicines.

e) **Taste of medication**: The taste of the medication becomes a problem mainly with pediatric oral liquid preparations. Geriatric patients also behave in a similar manner towards the taste of medications. More un palatable the dose, more are the chances of it being missed or discontinued as soon as there are any signs of improvements.

f) **Administration of medication**: Administration problems arise due to incorrect measurement or use of in appropriate devices. Some patients may fail to use metered dose inhalations (MDI) properly and could result in adequate control of the disease condition (e.g. asthma). Patients should be advised about the techniques for administering medications to infants and young children as well as the use of oral dosing devices like the metered dose aerosol inhalation device.

4. **Religious beliefs**: Religious beliefs can also affect adherence. It is mainly due to the materials used in the medicines. Alcohols, porcine insulin, gelatin capsules, shark liver oil, etc., are examples of items that were avoided by certain religious people. People of some cultures associate diseases with spiritual causes and not see the relevance of medicines.
5. **Social and psychological factors**: the level of confidence a patient has in his doctor, is an important factor in adherence. If the confidence is less, the chances of adherence with doctors direction is less, as the patient doubt the effectiveness. If the confidence level is very high, patient may tend to over comply. Certain patients may develop confidence in certain medicines based on their own experience or from others or publicity (advertisement). People may see medicines in different ways, some will see them highly useful and needy, and others consider them as dangerous, risky or poisonous items.[19,20,21]

PATIENT EDUCATION: [22]

The OIG report in US (OIG, 1990), and the Nuffield report in UK, had recommended patient education as the best way to improve adherence. Many factors may influence the effectiveness of educational efforts and the development of adherence in patients. When the information is very precise or too detailed, or the

patient may not understand or comprehend it. Complex terms and unnecessary jargons should be avoided.

ADHEREN CE AIDS : 23

The patient adherence can be reinforced considerably with the help of various aids including;

- Labeling: the labeling of the dispensed items should be accurate and specific. Auxiliary labels providing additional information regarding the use, precautions and storage will contribute to patient adherence.
- Medication calendars and drug reminder charts.
- Special medication containers: 28- compartment "Mediset" container and "Dosett "dispensing device (manufactured by Apothecary products, inc. and Astra pharmaceuticals respectively) are examples of special medications containers. This device contains 4 compartments for different time periods (e.g. morning, afternoon, evening, bedtime) for each day of the week.
- Adherence packing: It is defined as a prepackaged unit that provides one treatment cycle of the medication to the patient in a ready to use package.
- Leaflets: The most satisfactory of the leaflets is the patient package insert (PPI), supplied with unit pack items. They should contain clear instructions in simple language and clear illustrations.
- Posters: Additional information can be provided by posters, pictures and warning cards.

CANCER 24,25,29

The body is made up of trillions of living cells. Normal body cells grow, divide, and die in an orderly way. During the early years of a person's life, normal cells divide faster to allow the person to grow. After the person becomes an adult, most cells divide only to replace worn out, damaged or dying cells.

Cancer begins when cells in a part of the body start to grow out of control. There are many kinds of cancer, but they all are start because of this out of control growth of abnormal cells. Cancer cell growth is different from normal cell growth.

Instead of dying, cancer cells keep on growing and form new cancer cells. These cancer cells can grow in to (invade) other tissues, something that normal cells cannot do. Being able to grow out of control and invade other tissues is what makes a cell cancer cells.

THE CELL CYCLE:[44]

Cell proliferation is involved in many physiological and pathological processes including growth, healing, repair, hypertrophy, hyperplasia and the development of tumours. Angiogenesis (the development of new blood vessels) necessarily occurs during many of these processes.

Proliferating cells go through what is termed the cell cycle, during which the cell replicates all its components and then bisects itself into two identical daughter cells. Important components of the signalling pathways in proliferating cells are receptor tyrosine kinases or receptor-linked kinases, and the mitogen-activated kinase cascade. In all cases, the pathways eventually lead to transcription of the genes that control the cell cycle.

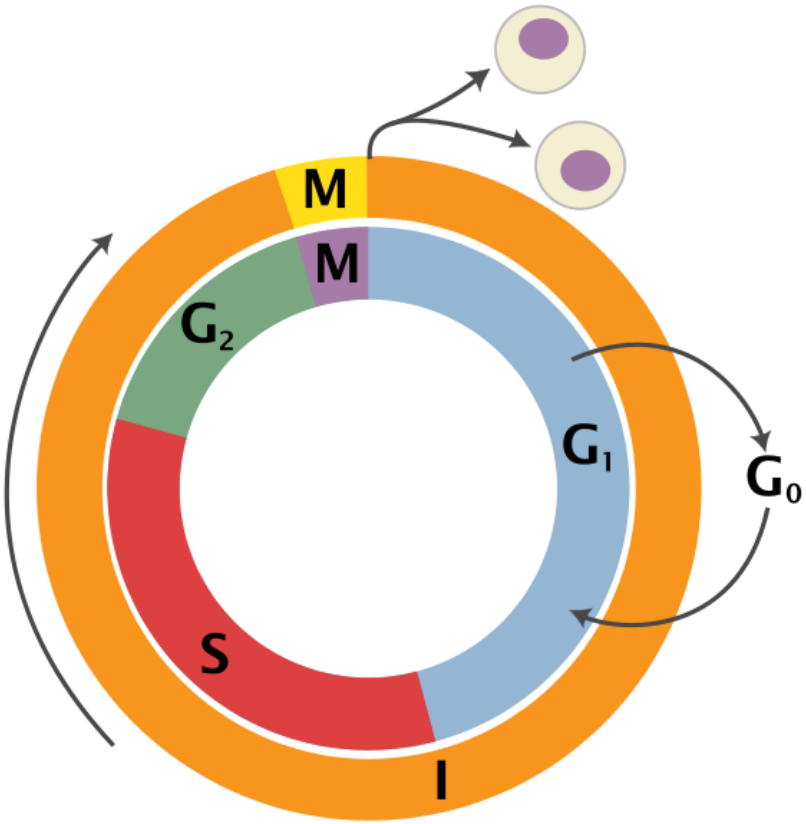


Figure showing cell division

All cells display a similar pattern during the cell division process, although differences in the duration of the cell cycle occur between cells of various types:

The cell cycle is an ordered series of events consisting of several sequential phases: G1, S, G2 and M.

- M is the phase of mitosis.
- S is the phase of DNA synthesis.
- G1 is the gap between the mitosis that gave rise to the cell and the S phase; during G1, the cell is preparing for DNA synthesis.
- G2 is the gap between S phase and the mitosis that will give rise to two daughter cells; during G2, the cell is preparing for the mitotic division into two daughter cells.

M Containing a double complement of DNA, divides in to **two daughter cells**. Each of these daughter cells may immediately re-enter the cell cycle or pass in to a non proliferative stage, referred to as G_0. The G_0 cells of certain specialized tissues may differentiate in to functional cells that no longer are capable of division. On the other hand, many cells, especially those in slow- growing tumors, may remain in the state for prolonged periods, only to re-enter the division cycle at a later time. Each transition in the cell cycle is controlled by the activity of specific cyclin-dependent kinases (CDKS), which are activated by their corresponding small regulatory proteins called cyclins, and inhibited by proteins such as p16. Mutations or loss of p16 or other components of the so-called retinoblastoma pathway such as retinoblastoma protein itself, or enhanced cyclin or CDK activity, will lead to relentless proliferation in tumor cells. Consequently, CDKs and their effector proteins have become attractive molecular targets for new antineoplastic agents.

In most cases the cancer cells form a tumor but some cancers like leukemia, rarely form tumors. Instead these cancer cells are in the blood and bone marrow. When cancer cells get into the blood stream or lymph vessels, they can travel to other parts of the body. There they begin to grow and form new tumors that replace normal tissues. This process is called metastasis. No matter where a cancer may spread, it is always named for the place where it started. For instance breast cancer that has spread to the liver is still called breast cancer not liver cancer. Likewise, prostate cancer that has spread to the bone is called metastatic prostate cancer not bone cancer.[30]

Not all tumors are cancerous. Tumors that aren't cancer are called “benign”. Benign tumors can cause problems they can grow very large and press on healthy organs and tissues. But they cannot grow in to other tissues because of this, they also can't sp read to other parts of the body (metastasize). These tumors are almost never life threatening. Malignant tumors are usually rapidly growing, invading surrounding tissue and, most significantly, colonizing distant organs. The ability of tumor cells to detach from the original mass (the primary tumor) and set up a metastasis (secondary tumor) discontinuous with the primary is unequivocal proof of malignancy.[31]

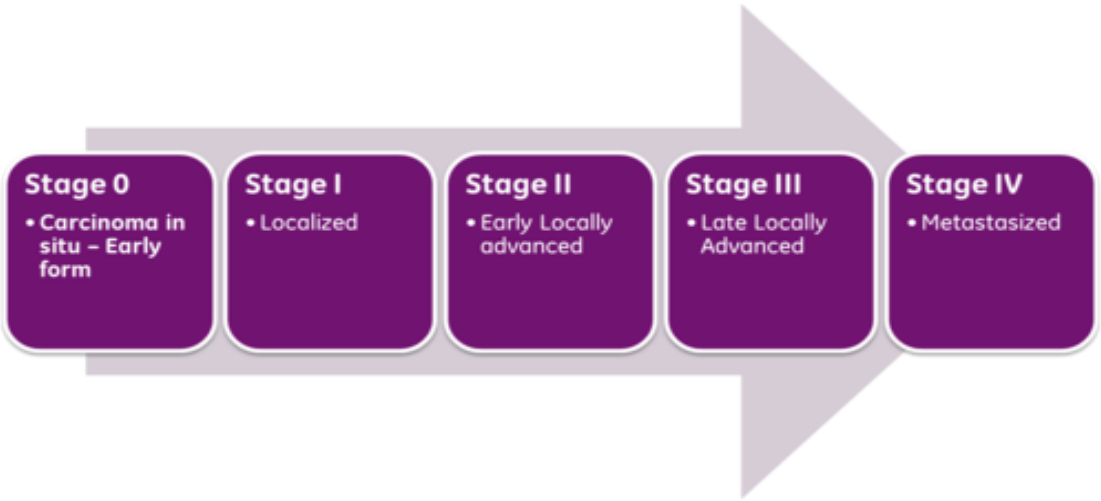
Neoplasm arises from transformed cells by a process known as multistep carcinogenesis. The first step in this process is called initiation, which is a change in DNA that can be induced by a variety of chemical, viral and physical agents. In most cases, the additional presence of a tumor-promoting agent is needed to complete the carcinogenic process. Individual susceptibility to malignant transformation may be influenced by genetic factors. This can relate to abnormal DNA mechanisms, to the variable expression of cellular oncogenes that appear to play a role in normal and abnormal cell differentiation, or to the loss of tumor suppressor genes. The subsequent growth of a transformed cell as a clone can lead to additional sub clones who have acquired genetic variability results in considerable tumor cell heterogeneity within any given tumor. Tumor cells may be less genetically stable than tumor cells- possibly from the activation or suppression of specific gene loci, the continued presence of carcinogens, the development of abnormal DNA repair mechanisms, or even nutritional deficiencies within the tumor. The inherent genetic instability of these cells, accompanied by variable processes of cell loss and selection, can result in advanced neoplasms with unique
biologic and cytogenetic characteristics.[32]

Neoplastic cells are quite similar to normal cells there for the drugs targeted to kill these cells can also kill normal cells. As most of these drugs are acting on rapidly dividing cells, the normal cells having quick turnover are most susceptible to toxicity.

STAGES OF CANCER:[46]

Overall Stage Grouping is also referred to as Roman Numerals, Staging. This system uses numerals I, II, III, and IV (plus the 0) to describe the progression of cancer.

- **Stage 0**: carcinoma insitu.
- **Stage I**: cancers are localized to one part of the body. Stage I cancer can be surgically removed if small enough.
- **Stage II**: cancers are locally advanced. Stage II cancer can be treated by chemo, radiation, or surgery.
- **Stage III**: cancers are also locally advanced. Whether a cancer is designated as Stage II or Stage III can depend on the specific type of cancer; for example, in Hodgkins disease, Stage II indicates affected lymph nodes on only one side of the diaphragm, whereas Stage III indicates affected lymph nodes above and below the diaphragm. The specific criteria for Stages II and III therefore differ according to diagnosis. Stage III can be treated by chemo, radiation, or surgery.
- **Stage IV**: cancers have often metastasized, or spread to other organs or throughout the body. Stage IV cancer can be treated by chemo, radiation, surgery.



There is a separate **TNM system** for each type of cancer. General descriptions of the TNM staging system are listed below.

T: The letter "T" plus a number (0 to 4) is used to describe the size and location of the tumor, including how far the tumor has grown into nearby tissues. A larger tumor or a tumor that has grown more deeply into the surrounding tissue is given a higher number. For some types of cancer, lowercase letters, such as “a,” “b” or "m" (multiple), are added to the “T” stage category to provide more detail.

N: The letter "N" plus a number (0 to 3) describes whether cancer has been found in the lymph nodes, and, in some types of cancer, how many of these lymph nodes contain cancer. Lymph nodes are tiny, bean-shaped organs that help fight infection. Lymph nodes located closest to where the cancer began are called regional lymph nodes. Lymph nodes in other parts of the body are called distant lymph nodes. Most often, the more lymph nodes with cancer, the larger the number assigned. However, for some types of tumors, the location of the lymph nodes with cancer may determine the “N” stage category.

M: The letter "M" indicates whether the cancer has metastasized (spread) to other parts of the body. If the cancer has not spread to other parts of the body it is said to be M0; if the cancer has spread to other parts of the body, it is considered M1.

ANTICANCER DRUGS:[45]

The available anticancer drugs have distinct mechanisms of action which may vary in their effects on different types of normal and cancer cells. A single "cure" for cancer has proved elusive since there is not a single type of cancer but as many as 100 different types of cancer. In addition, there are very few demonstrable biochemical differences between cancerous cells and normal cells. For this reason the effectiveness of many anticancer drugs is limited by their toxicity to normal rapidly growing cells in the intestinal and bone marrow areas.

Several classes of drugs may be used in cancer treatment, depending on the nature of the organ involved. For example, breast cancers are commonly stimulated by estrogens, and may be treated with drugs that inactivate the sex hormones. Similarly, prostate cancer may be treated with drugs that inactivate androgens, the male sex hormone. However, the majority of antineoplastic drugs act by interfering

with cell growth. Since cancerous cells grow more rapidly than other cells, the drugs target those cells that are in the process of reproducing themselves. As a result, antineoplastic drugs will commonly affect not only the cancerous cells, but others cells that commonly reproduce quickly, including hair follicles, ovaries and testes, and the blood-forming organs.

Antineoplastic drugs may be divided into two classes: cycle specific and non-cycle specific. Cycle specific drugs act only at specific points of the cell's duplication cycle, such as anaphase or metaphase, while non-cycle specific drugs may act at any point in the cell cycle. In order to gain maximum effect, antineoplastic drugs are commonly used in combinations.

PRECAUTIONS:[41]

Because antineoplastic agents do not target specific cell types, they have a number of common adverse side effects. Hair loss is common due to the effects on hair follicles, and anemia, immune system impairment, and clotting problems are caused by destruction of the blood-forming organs, leading to a reduction in the number of red cells, white cells, and platelets. Because of the frequency and severity of these side effects, it is common to administer chemotherapy in cycles, allowing time for recovery from the drug effects before administering the next dose. Doses are often calculated, not on the basis of weight, but rather based on blood counts, in order to avoid dangerous levels of anemia (red cell depletion), neutropenia (white cell deficiency), or thrombocytopenia (platelet deficiency.)

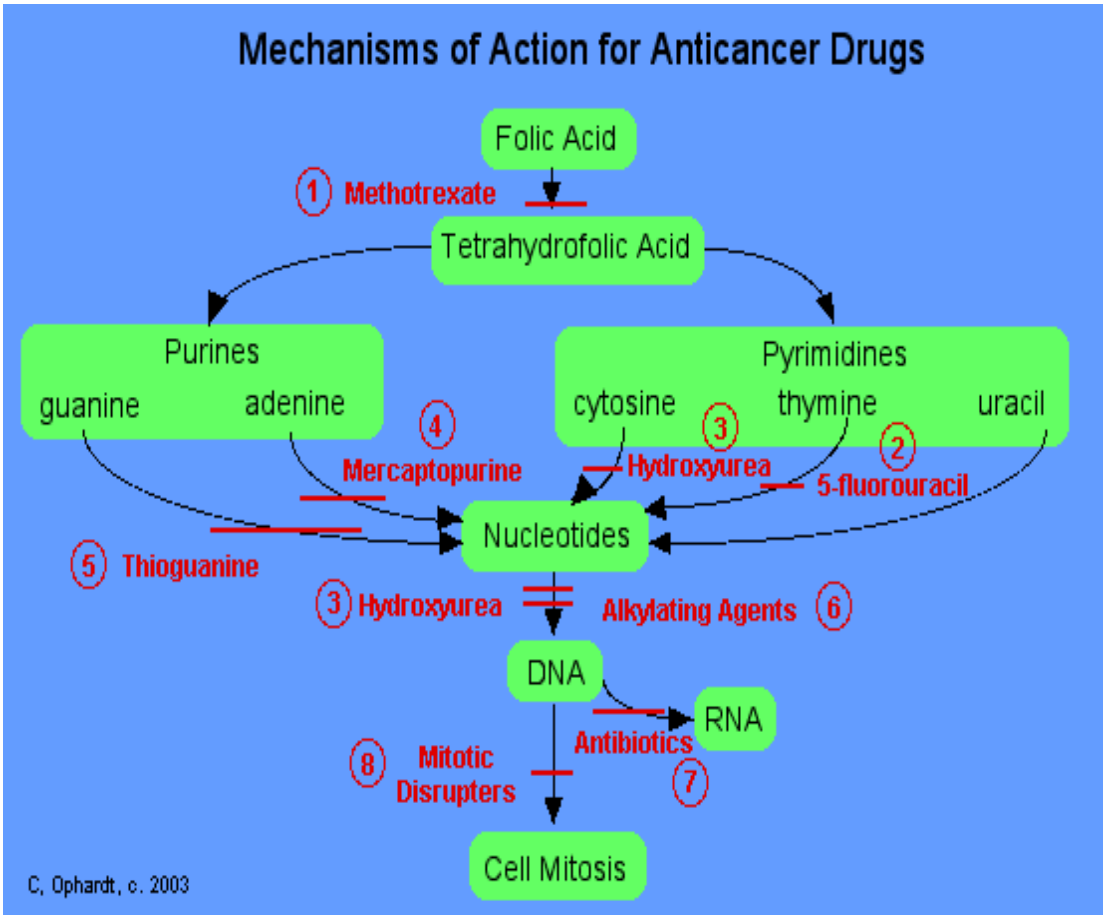
Appropriate steps should be taken to minimize side effects. These may include administration of antinauseant medications to reduce nausea and vomiting, maintaining fluid levels to reduce drug toxicity, particularly to the kidneys, or application of a scalp tourniquet to reduce blood flow to the scalp and minimize hair loss due to drug therapy.

Patients receiving chemotherapy also are at risk of infections due to reduced white blood counts. While prophylactic antibiotics may be useful, the health care professional should also be sure to use standard precautions, including gowns

and gloves when appropriate. Patients should be alerted to avoid risks of viral contamination, and live virus immunizations are contraindicated until the patient has fully recovered from the effects of chemotherapy. Similarly, the patient should avoid contact with other people who have recently had live virus immunizations. Other precautions which should be emphasized are the risks to pregnant or nursing women. Because antineoplastic drugs are commonly harmful to the fetus, women of childbearing potential should be cautioned to use two effective methods of birth control while receiving cancer chemotherapy. This also applies if the woman's male partner is receiving chemotherapy. Breastfeeding should be avoided while the mother is being treated.

Chemotherapy drugs, are sometimes feared because of a patient's concern about toxic effects. Their role is to slow and hopefully halt the growth and spread of a cancer. There are three goals associated with the use of the most commonly-used anticancer agents.[45]

1. Damage the DNA of the affected cancer cells.
2. Inhibit the synthesis of new DNA strands to stop the cell from replicating, because the replication of the cell is what allows the tumor to grow.
3. Stop mitosis or the actual splitting of the original cell into two new cells. Stopping mitosis stops cell division (replication) of the cancer and may ultimately halt the progression of the cancer.



Categories of Chemotherapy Drugs[45]

In general, chemotherapy agents can be divided into three main categories based on their mechanism of action.

- **Stop the synthesis of pre DNA molecule building blocks**

These agents work in a number of different ways. DNA building blocks are folic acid, heterocyclic bases, and nucleotides, which are made naturally within cells. All of these agents work to block some step in the formation of nucleotides or deoxy ribonucleotides (necessary for making DNA). When these steps are blocked, the nucleotides, which are the building blocks of DNA and RNA, cannot be synthesized. Thus the cells cannot replicate because they cannot make DNA without the nucleotides. Examples of drugs in this class include 1) methotrexate, 2) fluorouracil, 3) hydroxyurea, and 4) mercaptopurine.

- **Directly damage the DNA in the nucleus of the cell**

  These agents chemically damage DNA and RNA. They disrupt replication of the DNA and either totally halt replication or cause the manufacture of nonsense DNA or RNA (i.e. the new DNA or RNA does not code for anything useful). Examples of drugs in this class include cisplatin and antibiotics - daunorubicin, doxorubicin, and etoposide.

- **Effect the synthesis or breakdown of the mitotic spindles**

  Mitotic spindles serve as molecular railroads with "North and South Poles" in the cell when a cell starts to divide itself into two new cells. These spindles are very important because they help to split the newly copied DNA such that a copy goes to each of the two new cells during cell division. These drugs disrupt the formation of these spindles and therefore interrupt cell division. Examples of drugs in this class of 8) miotic disrupters include: Vinblastine (Velban), Vincristine (Oncovin) and Pacitaxel (Taxol).

Antineoplastic agents are drugs which are used in the treatment of cancer or malignancy. These drugs either kill or modify the growth of cancer cells.

Anti cancer drugs may be divided in to (on the basis of stage of cell cycle at which these acts) two groups- cell cycle specific (CCS) and cell cycle non specific (CCNS). CCS drugs are effective when the cells are proliferating where as CCNS drugs are effective whether the cells are dividing or are in the resting phase. Cell cycle specific drugs are etoposide, antimetabolites, bleomycin, vinca alkaloids, taxanes, and estramustine. Cell cycle non specific drugs are platinum compounds, alkylating agents, anthracyclins, dactinomycin, mitomycin, and camptothesins.

The practice of cancer medicine has changed dramatically in the past four decades, as curative treatments have been identified for a number of previously fatal malignancies such as testicular cancer, lymphomas, and leukemia. New drugs have entered clinical use for disease presentations that were previously eit her untreatable or amenable only to local therapies such as surgery and irradiation. At present, adjuvant chemotherapy routinely follows local treatment of breast, colorectal, and lung cancer, and chemotherapy is employed as part of a multimodal approach to the initial treatment of many other tumors, including locally advanced stages of head and neck, lung and esophageal cancer, soft tissue sarcomas, and pediatric solid tumors. At the same time, chemotherapic drugs have found expanded utility in non cancero us

diseases. The same drugs used for cytotoxic antitumor therapy have become important components of immunosuppressive regimens for rheumatoid arthritis (methotrexate and cyclophosphamide), organ transplantation (methotrexate and azathioprine), sickle cell anemia (5- azacytadine and hydroxy urea), antiinfective chemotherapy (trimetrexate and leucovorin), and psoriasis (methotrexate).[33]

In designing specific regimens for clinical use, a number of factors must be taken in to account. Drugs are most effective in combination, and may be synergestic because of their biochemical interactions. It is more effective to combine drugs that do not share common mechanisms of resistance and that do not overlap in their major toxicities. Cyto toxic drugs should be used as close as possible to their maximum individual doses and should be given as frequently as possible to discourage tumor re-growth and maximize the dose intensity, the dose given per unit time, a key perimeter in the success of chemotherapy. S ince the tumor cell population in patients with clinically detectable disease exceeds 1 g, or 10 ^{9} cells, and since each cycle of therapy kills less than 99% of the cells, it is necessary to repeat treatments in multiple cycles to eradicate the tumor cells. An understanding of cell- cycle kinetics is essential for the proper use of antineoplastic agents. Many of the most effective cytotoxic agents act by damaging DNA. Their toxicity is greater during the S, or DNA synthetic, phase of the cell cycle, while others, such as the vinca alkaloids and taxanes, block the formation of a functional mitotic spindle in M phase. These agents have activity against cells that pass through the most vulnerable phase of the cell cycle. Accordingly, human neoplasams that currently are most susceptible to chemotherapeutic measures are those with a high percentage of cells undergoing division. S imilarly, normal tissues that proliferate rapidly (bone marrow, hair follicles, and intestinal epithelium) are subject to damage by most cytotoxic drugs, which often limits their usefulness. Conversely, slowly growing tumors with a small growth fraction (for example, carcinomas of the colon or non small cell lung cancer) often are less responsive to cycle- specific drugs.[34]

Traditionally, cancer drugs were discovered through large- scale testing of synthetic chemicals and natural products against rapidly proliferating animal tumor systems, primarily murine leukemias. Most of the agents discovered in the first two decades of cancer chemotherapy interacted with DNA or its precursors,

inhibiting the synthesis of new genetic material or causing irrepairable damage to DN A itself. In recent years, the discovery of new agents has extended from the more conventional natura l products such as paclitaxel and semi synthetic agents such as etoposide, both which target the proliferative process, to entirely new fields of investigation.

Chemotherapy: Is a cancer treatment that uses chemical agents to kill cancer cells. The chemicals have a specific toxic effect upon cancer cells. They either destroy them or prevent the malignant cells from multiplying. The chemotherapy drugs may also have the same effect on normal cells. Administration of the drugs requires close monitoring for toxicity levels and for the patient's to therapy. Traditionally, chemotherapy has been administered by intravenous infusion in an oncology inpatient units or clinic or physicians office. Over the past decade, however, self administration of oral chemotherapy has increased because of the availability of novel therapeutic agents.[35]

With the development of oral anticancer agents, patients have more choices and improved convenience with receiving treatment than before. Yet, this implies that patients have to assume greater responsibilities for their treatment, with regards to adherence and safe handling of their medications. Numerous advantages to the use of oral chemotherapy have been described, including increased control and convenience for the patient, potential increase in the quality of life, sustained medication exposure, and potential reduction in travel costs and use of health care resources. Despite these advantages, it is imperative to note that multiple factors associated with oral chemotherapy can compromise patient safety and contribute to medication errors, contamination and inadvertent exposure to other individuals.[30,36]

Chemotherapy because of its relatively narrow therapeutic index is often associated with a greater risk of adverse events (AEs) than other medications, and when used in combination, may result in an even greater incidence of AEs. in contrast to administration in the institutional setting, where the prescribed medication, dose, regimen and response to therapy are subject to several levels of assessments, patient or caregiver (defined as family members, friends who assist the patient)

administration of oral chemotherapy is more likely to be susceptible to errors, non adherence, and increased AE s as a result of lack of coordinated care. Although there are no publications comparing chemotherapy errors that occur with oral versus intravenous administration, known issues with oral administration include incorrect dosing and limited monitoring, which can lead to under dosing or overdosing, serious toxicity, morbidity and mortality. In addition patient non adherence to oral chemotherapy is a significant problem, which is a less of concern with parenteral therapy given in an institutional setting under the supervision of health care professionals.[37,38]

Accidental exposure to oral chemotherapeutic agents can occur at various stages during handling (i.e. transport, unpacking, storage, handling, administration and disposal). Thus guidelines for safe and appropriate handling across the health care continuum are imperative.

The shift to treating cancer with oral agents challenges traditional attitudes towards cancer care and requires new concepts of organization of oncology services. One of the most important challenges is the education of patients and the question of patients' adherence to treatment instructions.[40] The use of orally administered anti cancer therapy is likely to increase dramatically in the coming years. Agents such as tamoxifen, prednisone, and oral cyclophosphamide have long been part of the management of many malignancies. More recently developed oral chemotherapy formulations include fluorouracil derivatives, idarubicine, etoposide, vinorelbine, oral taxanes, and fludaribine. New oral drugs have shown promising early clinical trials (e.g. S TI- 571 for chronic myelogenous leukemia) and many other novel agents are administered orally. Oral agents also have dominant role in the evolving field of chemoprevention of malignancies, where oral administration may improve efficacy in some settings by facilitating chronic exposure to the drug.[5,13,28]

Because oral counter parts of intravenous (I V), agents may have different side effects profiles, they may be better tolerated in some circumstances. Furthermore, as oncologists pay more attention to patient preferences and quality of life issues in clinical care, treatment options that enhance flexibility for patients are likely to be

used more often. Adherence to any interventions over long periods is determined largely by the individual perceptions of the risks, benefits and costs of the intervention. Costs in this sense include not only economic outcomes but also the potential toxic effects of therapy. The psychosocial implications of taking medication(s) on an ongoing basis and the logistic demands of such treatments must also be considered. Adherence rate for many long term drug therapies have been shown to be strikingly low, often no more than 40% - 50%. C linicians generally assume that patients are taking the drugs are prescribed and, if they discuss the topic with their patients at all, believe their patients when they say they are taking their medications as prescribed. Subjective estimates of adherence by physicians and nurses are unreliable for assessing patient's medication use, with clinicians often failing to detect markedly poor adherence to prescribed regimens. Even when health care providers are aware of potential non adherence problems, they have been found to be unable to predict correctly which patients will adhere to therapy.

ADHERENCE IN ONCOLOGY:[5,26,27,38]

Cancer patients are generally thought to have higher adherence rates than other patients because they are highly motivated by the gravity of their disease. However, cancer patients appear to have similar adherence rates to those of patients with other diseases. Treatment duration plays a role in adherence to the regimen. When the medication is continued over a longer period of time, patient become less adherent. The measurement of adherence with medication that is used in complex cyclic schedules with stop periods and many individual adjustments during treatment, as often occurs in oncology, is challenging, since this is more difficult than the measurement of medication used on a regular daily bases.[46]

Medical oncologists and hematologists may not always consider the issue of adherence. As yet suboptimal adherence may prove to be the greatest barrier to the various newly introduced oral anti cancer agents.

This study is intended to prescribe patients behavior regarding adherence and safe handling of oral anti cancer drugs. Few published studies have focused on adherence to oral anti neoplastic therapy, impart because the vast majority of

chemotherapy is delivered intravenously in physicians offices or hospitals. With the rise in availability and increasing use of oral anti cancer agents, concerns about adherence to prescribed regimen will become an increasingly important issue in oncology.

HAZARDOUS DRUGS[42,43] include those used for cancer chemotherapy, antiviral drugs, hormones, some bioengineered drugs, and other miscellaneous drugs.

Hazardous drugs are drugs that pose a potential health risk to health care workers who may be exposed during preparation or administration. Such drugs require special handling because of their inherent toxicities. While most drugs are hazardous because they are cytotoxic, drugs from other categories are potentially harmful.

Table 1. Criteria for Defining Hazardous Drugs

Drugs that meet one or more of the following criteria should be handled as hazardous:

- Carcinogenicity
- Teratogenicity or developmental toxicity
- Reproductive toxicity
- Organ toxicity at low doses
- Genotoxicity
- Structure or toxicity similar to drugs classified as hazardous using the above criteria

From *Preventing Occupational Exposures To Antineoplastic And Other Hazardous Drugs In Healthcare Settings*. (NIOSH, 2004)

Many hazardous drugs used to treat cancer bind to or damage DNA (for example, alkylating agents). Other antineoplastic drugs, some antivirals, antibiotics, and bioengineered drugs interfere with cell growth or proliferation, or with DNA synthesis.

For example, antineoplastic drugs such as cyclophosphamide have immunosuppressant effects that proved beneficial for treating nonmalignant diseases such as rheumatoid arthritis and multiple sclerosis[Abel 2000].

All hazardous drugs, regardless of the formulation, should be labeled as such to prevent improper handling. Tablet and capsule forms of hazardous drugs should not be placed in automated counting machines, which subject them to stress and may introduce powdered contaminants into the work area. Counting and pouring of hazardous drugs should be done carefully, and clean equipment should be dedicated for use with these drugs. Crushing tablets or opening capsules should be avoided and liquid formulations should be used whenever possible. During the compounding of hazardous drugs (e.g., crushing, dissolving, or preparing a solution or an ointment), workers should wear non-permeable gowns and double gloves. Compounding should take place in a ventilated cabinet whenever possible [ASHP 2006].

The main route of exposure to hazardous drugs was thought to be inhalation of drug aerosols generated during preparation. To reduce this risk, OSHA guidelines state that cytotoxic drug preparation must be performed in a biological safety cabinet (BSC) in a designated area, usually a pharmacy. A BSC has vertical airflow that moves away from the worker, as opposed to horizontal airflow that moves away from the product toward the worker. Vertical airflow protects the worker, while horizontal airflow is designed to protect the sterile product from contamination. Air leaving a BSC is filtered through a HEPA (high efficiency particulate air) filter.

Table 2. Routes of Exposure to Hazardous Drugs
• Inhalation of aerosolized drug • Dermal absorption • Ingestion • Injection

Nurses who administer chemotherapy can be exposed to aerosols or droplets of drugs generated during administration. Body fluids of patients receiving hazardous

drugs are a potential source of exposure. Gloves and gowns are recommended to protect nurses against splash contamination during drug administration and handling patient wastes.

Table 3. Personal Protective Equipment for Hazardous Drug Handling

- Gowns – disposable, made of fabric that has low-permeability to the agents in use, with closed-front and cuffs, intended for single use.
- Gloves – powder-free, labeled and tested for use with chemotherapy drugs, made of latex, nitrile, or neoprene.
- Face and eye protection when splashing is possible.
- A NIOSH-approved respirator when there is a risk of inhaling drug aerosols (such as spill clean up).

(ASHP, 1990; Brown et. al, 2001; NIOSH, 2004; OSHA, 1996, OSHA, 1999)

"Procedures for proper handling and disposal of anticancer drugs should be considered. Several guidelines on this subject have been published. There is no general agreement that all of the procedures recommended in the guidelines are necessary or appropriate."

Hazardous drug handling is potentially risky work. Many nurses have the potential to be exposed to hazardous drugs in the workplace. OSHA, ASHP, ONS, and NIOSH all provide guidelines for the safe handling of hazardous drugs. While not providing complete protection, it is believed that adherence to current recommendations will reduce health care workers' exposure. By reducing exposure, the negative health effects should be reduced. It is time for nurses to take their own occupational safety as seriously as the safety of the patients under their care.

1. **Sim M.H, Leaw Y.C and Chan A (2007)** carried out a study on safe handling of oral anticancer agents: perspectives from breast cancer patients at National cancer centre. Of the 126 surveys, 121 fit the inclusion criteria, of which 57 are breast patients. Only 10% (17.5%) indicated that oral and parenteral anticancer agents are equally potent. Eight (14%) considered their oral anticancer agents to be more potent than the parenteral once. All disagreed or strongly disagreed that it was difficult to understand. Their regimen and 51 (89.5%) disagreed or strongly disagreed that it was difficult to adhere. 49 (86.0%) would dispose the bottles used to contain their oral anti cancer agents directly or indirectly down the chute and only 6 (10.6%) would inform their healthcare professionals about any leftover medications before the next refill or appointment. [36]

2. **Lonneke Timme rs et al** carried out study on 'the use of capecitabine in daily practice 'A study on adherence and patients experiences, in the department of medical oncology, VU university medical centre, Amsterdam, the Netherlands. In this multicentre, prospective, observational cohort study, 90 patients aged 18 years or older starting treatment with capecitabine will be included and followed for a period up to five cycles. The main study parameters are adherence, patient attitude towards medication, and the number and grade of patient reported sideeffects. The percentage of patients who are non adherent with drug therapy is estimated at 35% for patients with negative attitude towards capecitabine, and at 10% for patients with a positive attitude towards capecitabine. [27]

3. **Veerle foulan et al. (2012)** Studied of adherence to oral anticancer drugs (O AD) in patients with metastatic renal cancer (mRCC): interim results of the p rospective, observational, multicentre, IPSOC study (investigating patients satisfaction with oral anti cancer treatment). The study was conducted at 11 Belgian hospitals between 02/2011 and 05/ 2012. 80 patients with a median age of 65 years have participated in the study. With a median follow up of 150 days (range 3-465) 87% of patients claimed to be fully adherent (based on MMAS and C TSQ data) 10 patients indicated to have missed at least one dose, for which the most important reasons were forgetting (38% of cases) and side effects (31 %) based on MEMS r data, mean adherence, defined as the percentage of days with at least the prescribed number of dosage taken was 97.95% interestingly, the prescribed regimen was changed or interrupted by the treating oncologist in 36 % of cases. [22]

4. Lucca et al. (2012) tested an educational intervention to enhance knowledge and adherence to Erlotinib while monitoring for side effects in 30 patients. Adherence behaviors were measured with the 8- items Morisky medication adherence scale (MMAS-8). MMAS - 8 adherence scores were median to high and the mean number of Erlotinib adverse event was 2.48 per patient. 22 % reported four or more side effects.[5]

5. Anne S Oberguggenberger et al carried out the study on adherence evaluation of endocrine treatment in breast cancer: methodological aspects. It was carried out at the department of gynecology and obstetrics, medical university Inns bruck. The aim of the study was to compare four adherence measurement methods for their concordance in breast cancer patients undergoing anastrazole treatment. The result was found that the comparison of the four approaches using Spearman rank correlation revealed poor concordance across all methods reflecting weak correlations of 0.2-0.4. Considering this data incomparability across methods, they still observe high adherence rates of 78 -98% across measures.[30]

6. Timme rs et al. (2011) studied an ongoing prospective observational cohort study is examining adherence ove r 16 weeks for patients with non small cell lung cancer. Adherence is measured using MMAS -8, several questionnaires and plasma level of Erlotinib. F indings from this study will provide information about adherence and short term persistence to Erlotinib.

7. Hess et al. (2012) examined adherence Sorafenib, S unitinib and Everolimus and found 81% had adherence rates of 80% or higher. Wolter et al. presented preliminary data of a prospective observational study measuring adherence using MEMS (medication events monitoring system). Adherence was 98.9%.[33]

8. Gebbia et al. **(2012)** evaluated the impact of a treatment- monitoring intervention on adherence for patients with advanced non small cell lung cancer receiving erlotinib as second line therapy in two cohorts 1) a retrospective non-interventional phase monitoring 50 participants without a treatment management strategy and 2) a prospective interventional phase following 150 participants who received a treatment management program including identification of a caregiver,

patient or caregiver education and training about treatment and side effects of therapy, a calendar for following visit, and a dedicated fac smile phone line to receive instructions or use of a fast track visit system. Adherence was measured using multiple methods and generally patient self reported adherence was higher than adherence measured by pill counts. Disease control rate (complete response plus partial response plus stable disease was 44% in the first cohort and 63% in the second cohort (p=0.0368) also a significant correlation was found between the number of adverse events and adherence (r= 0.176, p= 0.035).[35]

9. Addeo et al. (2011) conducted a study on adherence to lapanib by using self report, medication diaries and pharmacy controlled drug boxes. The study was carried out in 69 women and the adherence was 82%, with a 65% rate of dosing violations.

10. Landier and Wandy et al carried out a study on predictions of non adherence to oral chemotherapy in children with acute lymphoblasts leukemia enrolled on children's oncology group study (AALL03N1) to determine the prevalence of self/ parent reported non adherence to oral 6- mercaptopurine during the maintenance phase of A.L.L therapy. 22% of children in the cohort were non adherent to oral chemotherapy, defined as missing more than one dose of 6- mercaptopurine for non medical reasons over the 112 day observation period. The risk of non adherence was significantly increased for those who failed to perceive the severity of the child's illness.[37]

11. Patridge et al. Conducted the study on adherence with capecitabine reported at The 2008 American society of clinical oncology annual meeting that 76% of 161 breast cancer patients took at least 80% of their prescribed capecitabine doses, as measured by electronic monitoring system during a six cycle period. [14]

12. Winterhalder et al. Assessed adherence to capecitabine with self report in diaries. They observed that 91% of patients were adherent with all doses. [39]

13. Smith et al. conducted the study of adherence in pediatric patients, used a urine assay for a 17- ketogenic steroid drug metabolite to differentiate between patients who taking prednisone as directed and those who were not, In 52 pediatric patients with leukemia or non Hodgkin's lymphoma, 33% of children overall and 59% of the adolescents were poorly adherent, as defined by lower than expected levels of the urinary predmisone metabolite when sampled at random times. [40]

14. Wate rhouse et al. In a study of 26 patients with breast cancer, found that patients self report and pill count statistically significantly over estimated the degree to which patients adhered to their tamoxifen regimen, as compared with data recorded by the MEMS device, in this study, patients were monitored for approximately 3 months and classified as adherent if 80% or more of the tamoxifen doses were taken as prescribed. This rate was chosen as the cutoff because it is frequently cited in the literature as achievable or acceptable, when all dosing errors as measured with MEMS were considered, 18 of 24 patients were non adherent, that is they took less than 80% of their doses as prescribed (including dose omissions and/ or schedule errors) during the monitoring period. If only dose omissions as recorded with MEMS were considered, patient adherence rates ranged from 36.4% to 100% with an overall average of 85.4% (standard deviation+/17.2%).[5]

AIM:

In view of increased usage oral anti cancer drugs in the contemporary treatment of cancer, this study intended to describe patients' experience and their adherence of oral anti cancer drugs by using a combination of multiple choice, scaled and open ended questions. For the purpose of this study, anti cancer agents would include cytotoxics and hormonal agents.

OBJECTIVE:

1) To investigate cancer patients' adherence with their oral anticancer agents.
2) To study the patients' experience with their oral anticancer drugs, especially the behavior regarding handling and storage.

The present dissertation work was planned to conduct A STUDY ON PATIENTS' MEDICATION ADHERENCE AND PRACTICES WITH THEIR ORAL ANTICANCER AGENTS. The present study was planned to conduct in the outpatient Department of Oncology in Care Hospital, Hyderabad, Andhra Pradesh.

i. Submission of the protocol for getting the approval from Ethical committee.
ii. To get the consent letter from patients.
iii. Select the cancer patients with inclusion and exclusion criteria for study.
iv. To design a data collection form.
v. Patient medication adherence is measured by standard medication adherence questionnaire.
vi. Patients' behavior regarding safe handling and storage of medication has to determine.

STUD Y D ESIGN

This is a single centre, cross sectional, interviewer administered study carried out at the outpatient oncology department and outpatient pharmacy of CARE Hospital, Hyderabad. This study was reviewed and approved by the Institutional Ethics Committee of Ultra College of Pharmacy. Written and signed informed consent was obtained from all patients or caregivers prior to study entry.

SUBJECTS

Patients had received at least one cycle of oral anti cancer agent treatment (chemotherapy) or had been taking oral agents continuously for three months (hormone therapy) are eligible for this study. Selected patients had a confirmed diagnosis of cancer and receiving at least one oral anti cancer agents. To be eligible for this study patients were able to read and understand English, be 25 years old and above as well as willing participate in the study. According to the sample size a minimum number of 120 patients are to be enrolled.

Oral a ntica ncer age nts ava ilab le at CHH during stud y

Pharmacologic class	Oral anti cancer agents
Alkylating agents	Lomustine, cyclophosphamide, temozolomide
Antimetabolites	Azathiaprine, capecitabine, methotrexate, mercaptopurine
Antihormonal agents	Anastrazole, letrazole, flutamide, bicalutamide, tamoxifen
Immuno modulator	thalidomide
Topoisomerase inhibitors	Etoposide
Thyrosine kinase inhibitors	Erlotinib, gefitinib, imatinib
Multikinase inhibitors	Sorafenib, sunitinib

DATA COLLECTION AND ANALYS IS

A standardized procedure was adopted. The survey or procedure consisted of a combination of multiple choices, scaled and open ended questions. The content of the study or survey was divided in to two major areas.

1) Patients adherence to oral anti cancer drugs,

2) patients behavior towards handling of oral anti cancer drugs.

Most information is collected directly from patients or caregivers. The medical information is retrieved from the patients file.

PATIEN T FILE: The following items are obtained from the patient treatment file

- Disease characteristics, including disease stage and treatment line.
- Dose of the medication and co medication.
- Patients characteristics i.e. age, gender etc.

INTERVIEWS:

The interviews were carried out in the outpatient department of oncology and outpatient pharmacy at oncology departments. The following variables were investigated: age, gender, educational status, smoking, and alcohol consumption, currently prescribed oral anticancer drugs, amount of medication, and type of cancer, stage of cancer and tobacco use.

QUESTIONNAIRE

Adherence was measured by using the 8 item Morisky medication adherence scale (MMAS-8). The MMAS-8, an update with greater sensitivity of the four item scale was published in 1986 and it is considered as the most commonly used self reporting method to determine adherence, it contains eight questions with closed dichotomous (YES OR NO) answers, designed to prevent the bias of positive responses from patients questions asked by health professionals, by reversing the responses related to the interviewers' medication adherence behavior.

Thus each question measured a specific adherence behavior. O ut of eight questions seven questions must be answered negatively and only one question positively, and the last question being answered according to a scale of five options :

a) never or rarely,
b) once in a while,
c) sometimes,
d) usually,
e) all the time.

The degree of adherence was determined according to the score resulting from the sum of all the correct answers. If the score is 0 they will considered as following high adherence, if it is 1 or 2 points average adherence, and **>** 2 points, considered as poor adherence. Patients' attitude or action taken by the patient when they missed one dose is also checked. It is identified by using different sugges tions include skip missed doses, double up with the next dose, do not know, contact physician, resume taking the dose when remember. Another section this study discuss about the handling of drugs by the patients i.e. action take n after picking up the dropped medication, checking hand washing habits after handling oral anti cancer agents, how they store their anti cancer medication i.e. placed with other medication or placed separately.

METHODOLGY

STUDY DESIGN

A single centre, cross sectional, interviewer administered study.

STUDY CENTRE

Outpatient department of Oncology, Care Hospitals, Hyderabad.

STUDY POPULATION

Patients visiting the outpatient department of oncology, Care Hospitals, Hyderabad.

STUDY PERIOD

3 months

SAMPLE SIZE

120

STUDY ELIGIBILITY

INCLUSION CRITERIA

1) Patients of either sex aged > 25
2) Patients received atleast one cycle of oral anti-cancer agent treatment or had been taking oral anticancer agents continuously for 3 months.

EXCLUSION CRITERIA

1) Terminally ill patients
2) The use of oral anticancer drugs for non- oncological diseases

METHODOLGY

This is a single centre, cross sectional, interviewer – administered study going to conduct at the outpatient pharmacy of oncology department, Care Hospitals, Hyderabad. Patients' receiving at least one cycle of oral anticancer agent or have been taking oral agents continuously for three months are eligible for the study.

Patient medication adherence is measured by interviewing patients with medication adherence questionnaire. It consists of combination of multiple choice , scaled and open ended questions. The content of the study is divided in to 2 major areas;

1. Patients adherence to oral anticancer drugs,
2. Patients behavior regarding storage and handling of oral anticancer drugs.

A total of 126 patients' data were collected. Cancer patients receiving oral anticancer drugs were identified as eligible for inclusion in this study. A total of 126 patients provided written informed consent. The majority of patients were on capecitabine (38.88%), tamoxifen (30.95%), gefitinib (8.73%), aromatase inhibitors (6.34%), thalidomide (3.96%), imatinib, etoposide (2.38%), temozolomide, bicalutamide, methotrexate, sorafenib(1.58%). The median age of studied population was 54 years old (25-84).

PATIENTS DEMOGRAPHICS:

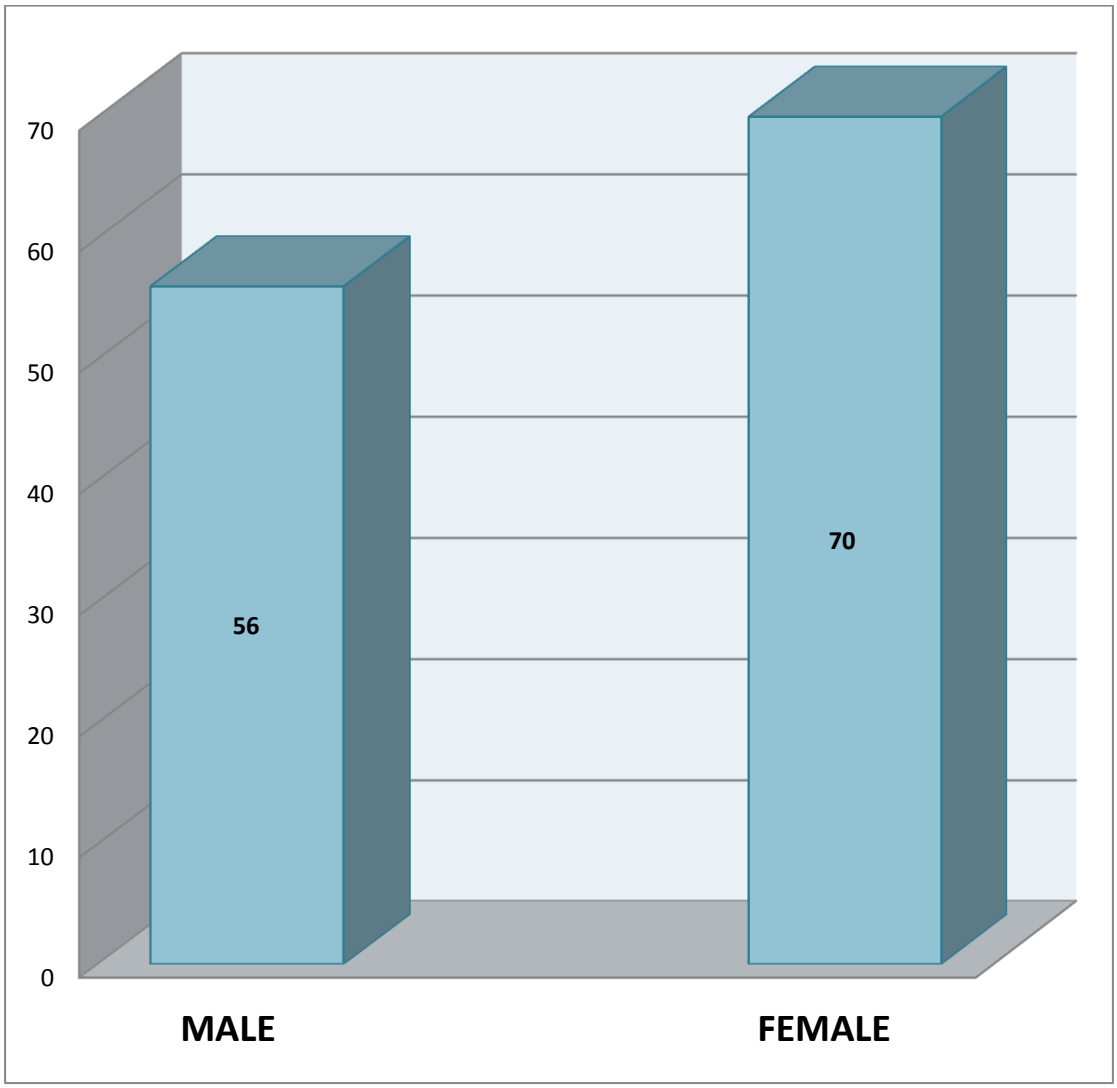
1) GENDER OF THE PATIENT:

TABLE NO:1

SEX	Frequency(n)	Percentage
MALE	56	44.44%
FEMALE	70	55.55%

n=126

GRAPHICAL REPRESENTATION OF DISTRIBUTION GENDER OF PATIENTS



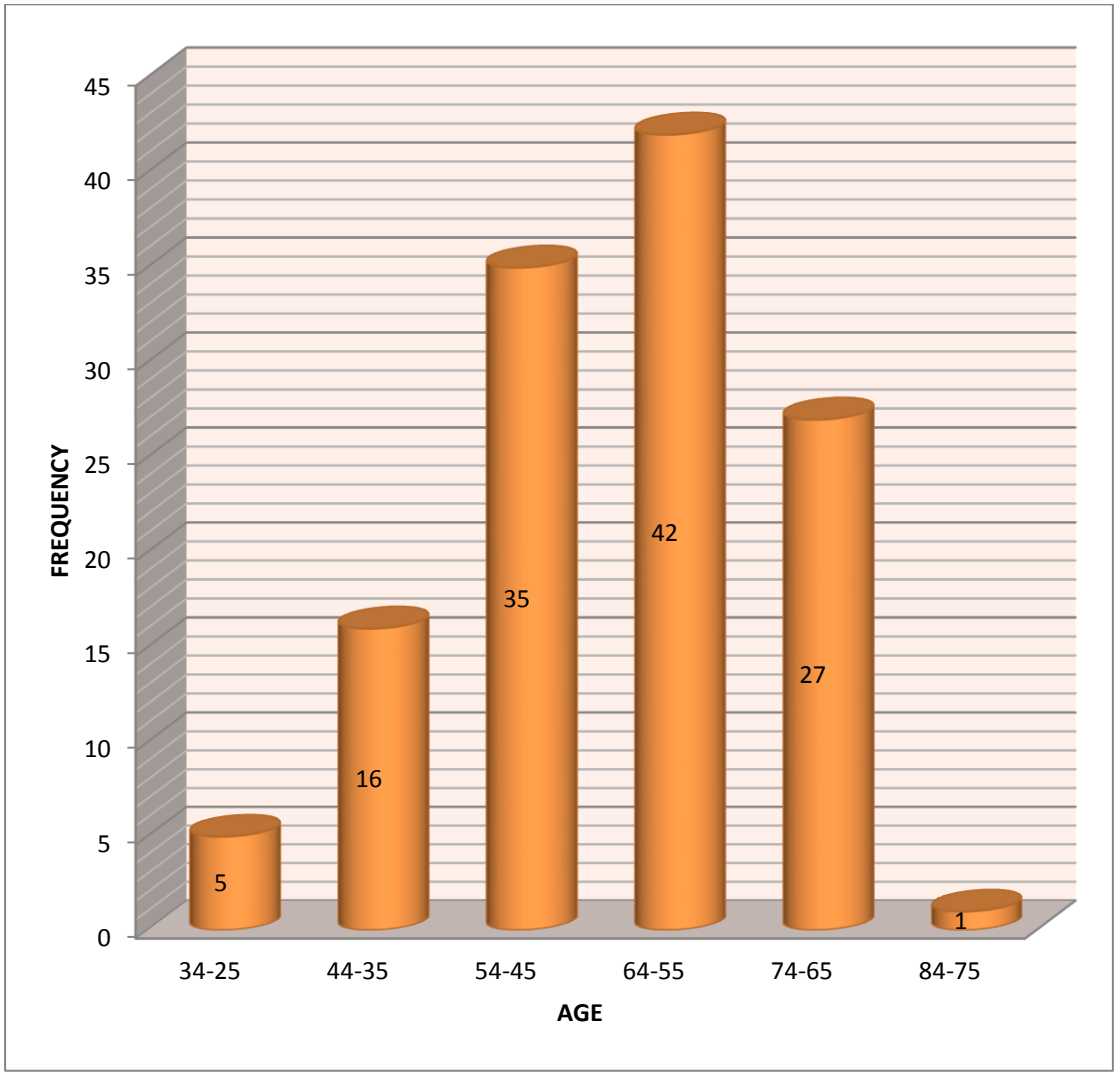
2) AGE DISTRIBUTION OF PATIENTS:

TABLE NO:2

Age group	Frequency(n)	Percentage
25-34	5	3.97%
35-44	16	12.7%
45-54	35	27.8%
55-64	42	33.3%
65-74	27	21.4%
75-84	1	0.08%

The median age of the patients was about 60 years, with the majority of the patients falling in the range of 45 to 74 years old.

GRAPHICAL REPRESENTATION OF AGE DISTRIBUTION OF PATIENTS:



3) EDUCATIONAL LEVELS OF PATIENTS:

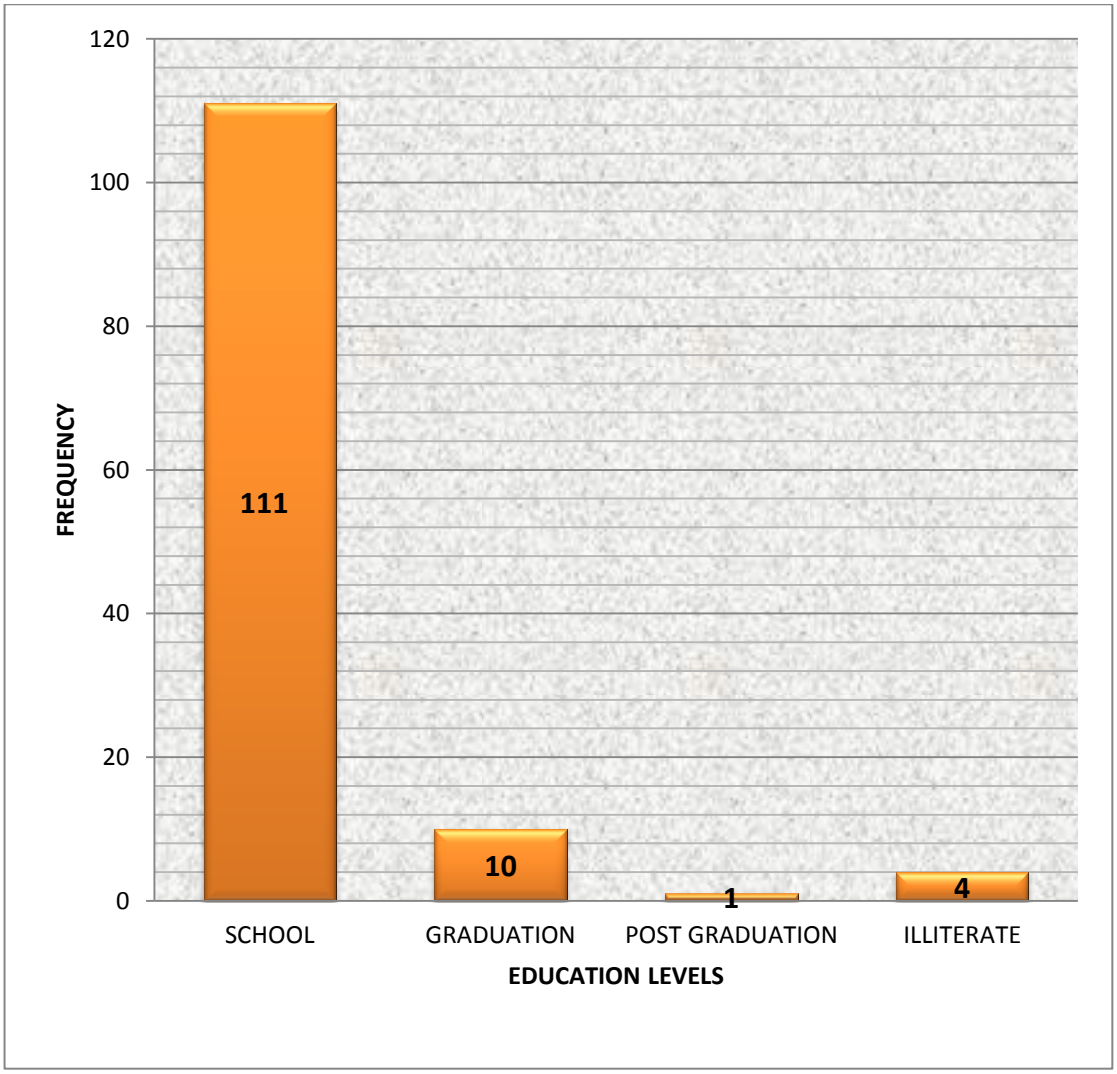
TABLE NO:3

Education	Frequency(n)	Percentage
School	111	88.09%
Graduation	10	7.94%
Post graduation	1	0.79%
Illiterate	4	31.17%

N=126

Majority of the patients 111(88.09%) having only secondary school education or less, 10 (7.94%) of the patients were graduates, 1 (0.79%) and 4 (31.17%) are illiterate.

GRAPHICAL REPRESENTATION OF EDUCATIONAL LEVELS OF PATIENTS:



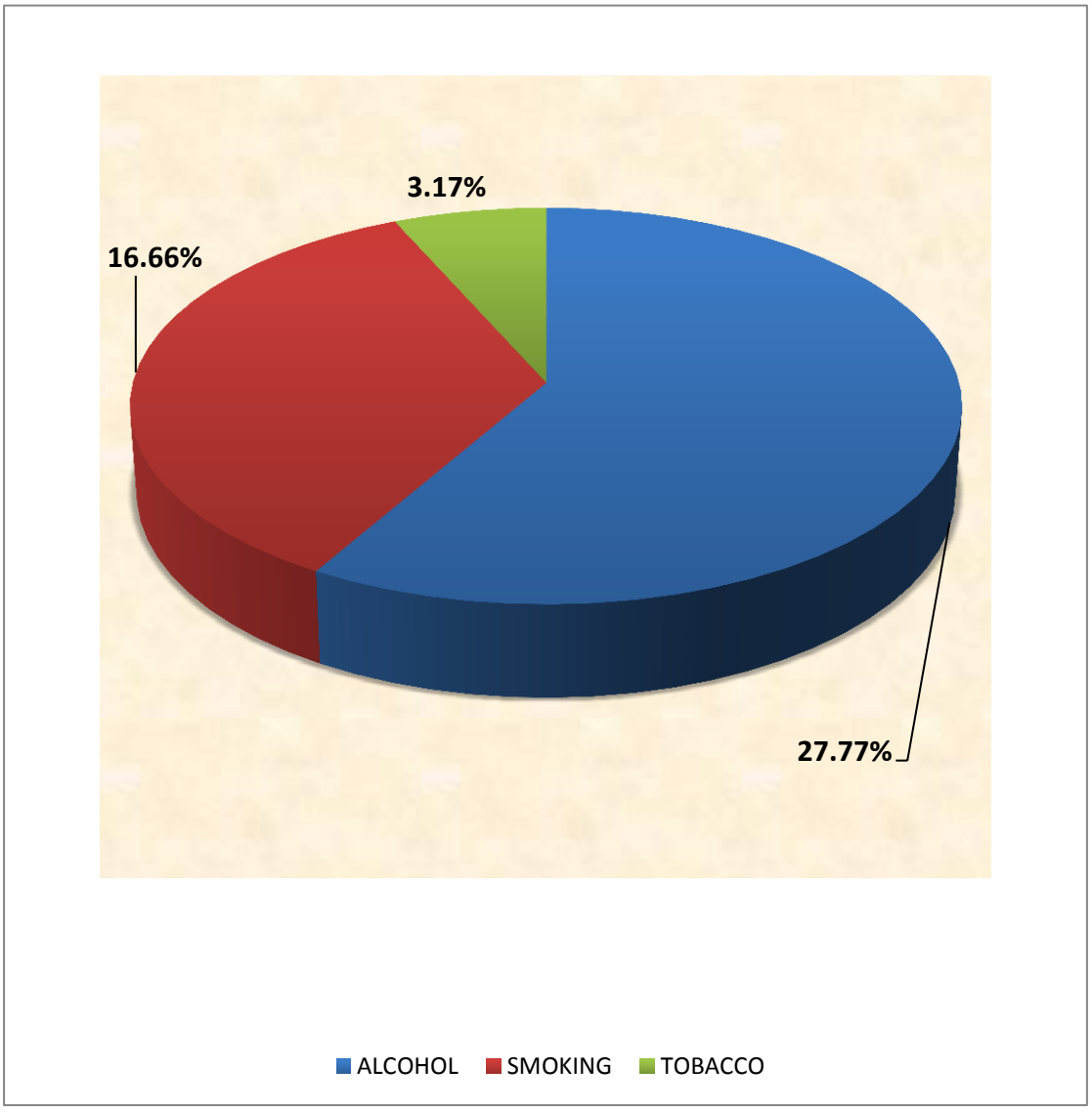
4) SOCIAL HABITS OF THE PATIENTS:

TABLE NO:4

Habits	Frequency(n)	Percentage
Alcoholics	35	27.7%
Smoking	21	16.66%
Tobacco use	4	3.17%

Different studies have suggested that the social habits of the patient will be a contributing factor in the development of the disease. Here in this study 35 (27.7%) patients were alcoholics, 21 (16.66%) were smokers and the number of patients using tobacco are 4 (3.17%).

GRAPHICAL REPRESENTATION OF SOCIAL HABITS OF THE PATIENTS:



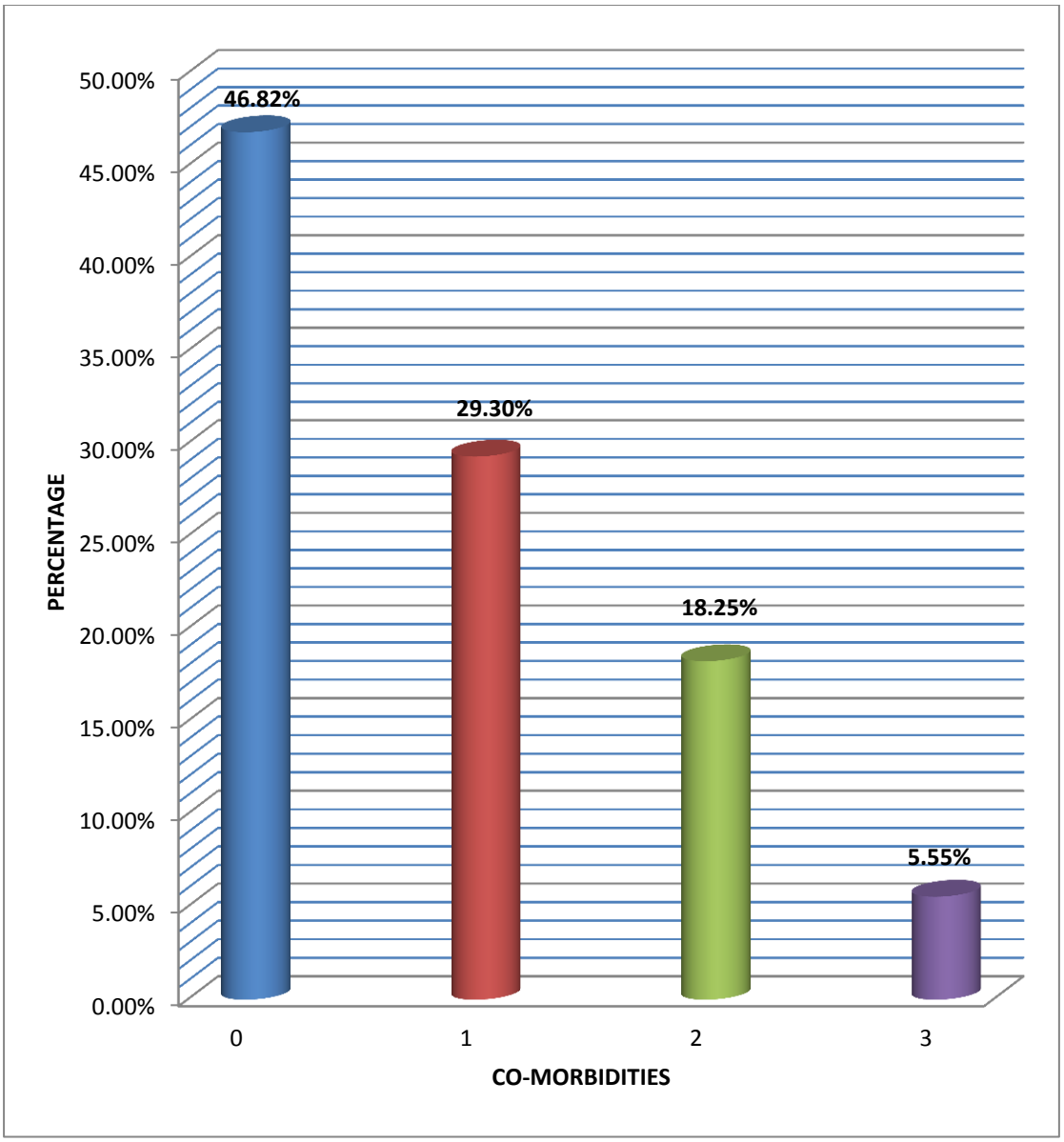
5) NUMBER OF COMORBIDITIES OF PATIENTS:

TABLE NO:5

No. of co-morbidities	Frequency(n)	Percentage
0	59	46.82%
1	37	29.3%
2	23	18.25%
3	7	5.55%

The comorbidities that were taken into consideration includes hypertension, diabetes, hypercholesterolemia, asthma. The majority of the patients 59 (46.82%) had none of the comorbidities, 37 (29.3%) had one of the comorbidities, 23 (18.25%) had two. A minority of 7 (5.55%) had 3 comorbidities.

GRAPHICAL REPRESENTATION OF NUMBER OF COMORBIDITIES OF PATIENTS:



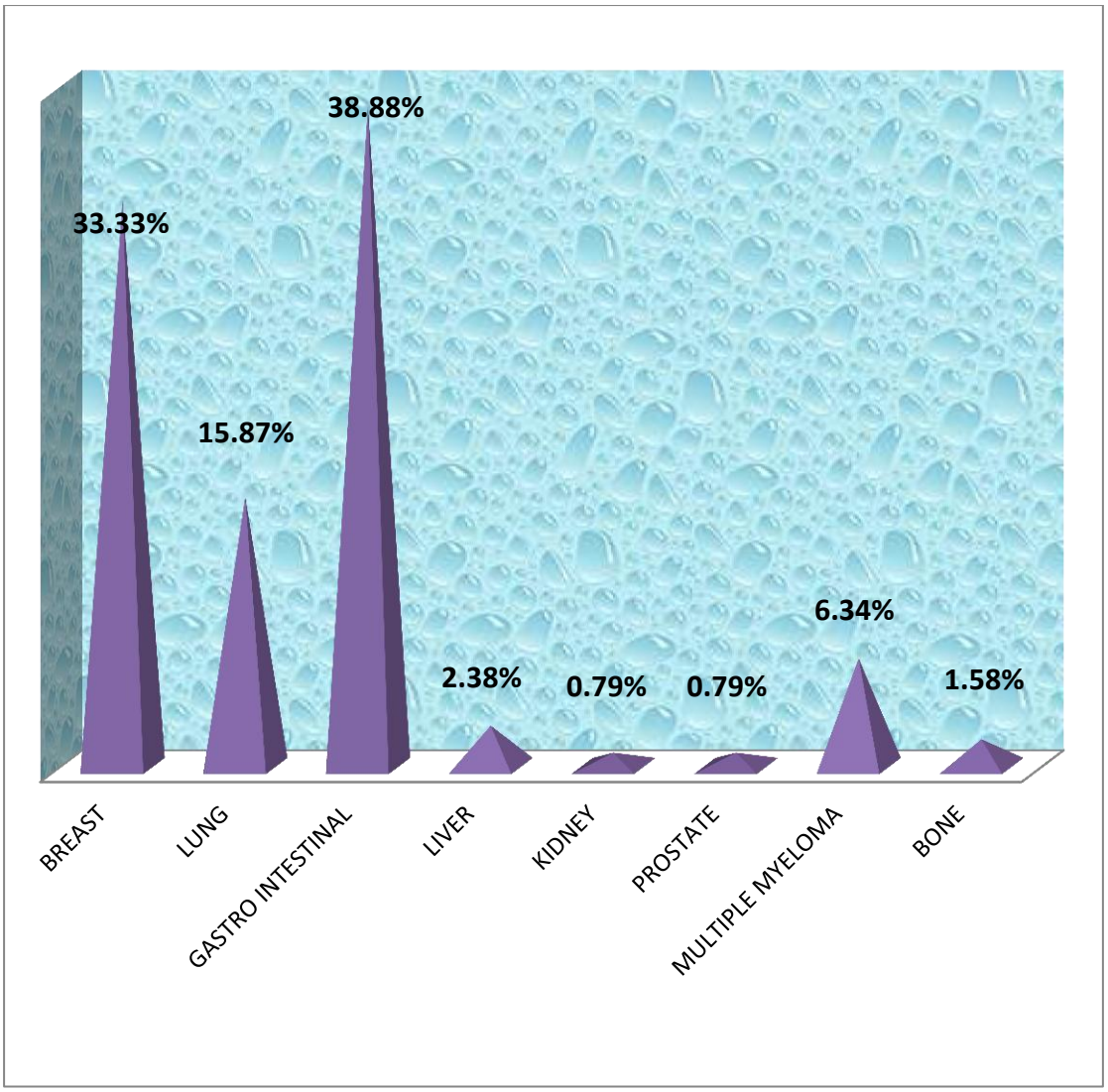
6) PRIMARY TUMOUR SITE:

TABLE NO:6

Tumor site	Frequency(n)	Percentage
Breast	42	33.33%
Lung	20	15.87%
Gastro intestinal	49	38.88%
Liver	3	2.38%
Kidney	1	0.79%
Prostate	1	0.79%
Multiple myeloma	8	6.34%
Bone	2	1.58%
	N=126	100%

In this study, majority of the patients had gastro intestinal cancer 49(38.88%), 42(33.33%) had breast cancer, 20 (15.87%) had lung cancer, 8 (6.34%) had multiple myeloma, 3 (2.38%) had hepato-cellular carcinoma, 2 (1.58%) had bone cancer and 1 (0.79%) had kidney and prostate cancer.

GRAPHICAL REPRESENTATION OF PRIMARY TUMOUR SITE



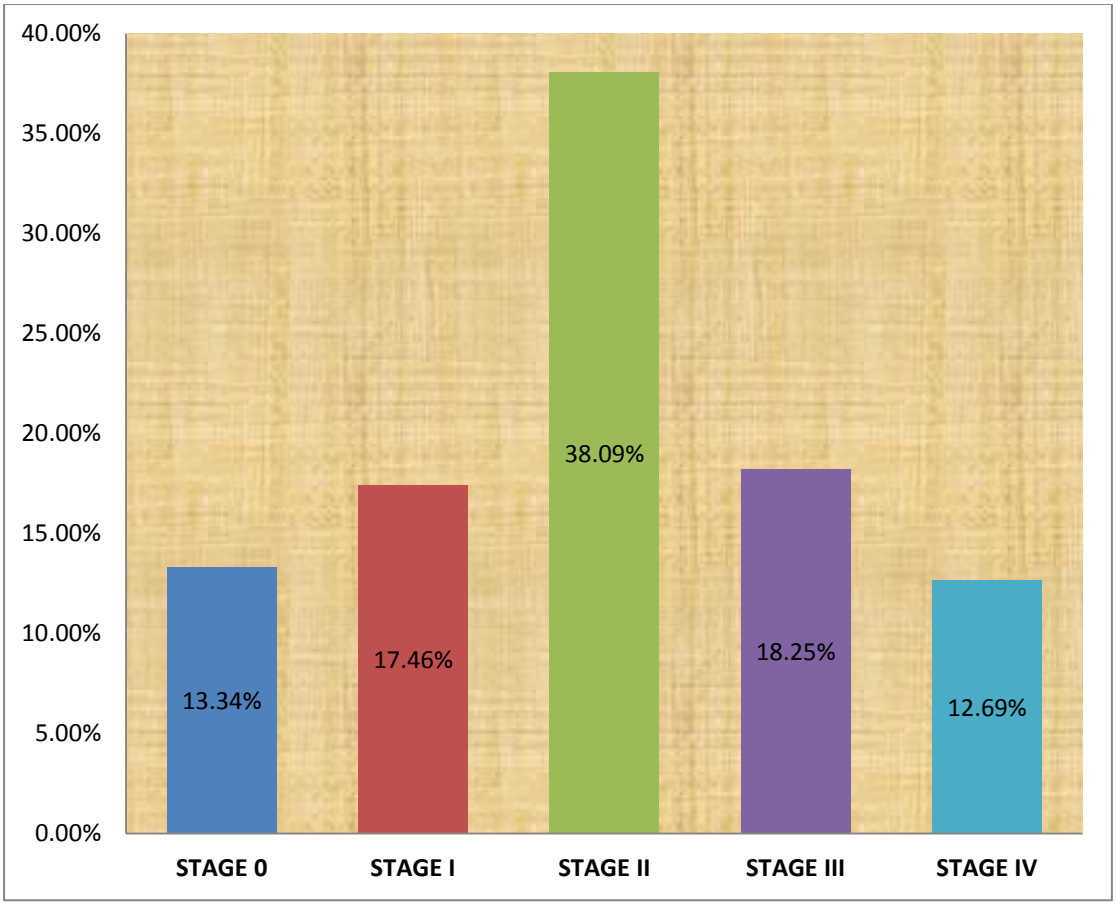
7) DISTRIBUTION OF CANCER STAGES OF PATIENTS:

TABLE NO:7

STAGE	FREQUENCY	PERCENTAGE
0	17	13.49%
1	22	17.46%
2	48	38.09%
3	23	18.25%
4	16	12.69%

Majority of the patients 87 (69.05%) had early stages of cancer- STAGE 0 to STAGE II. The remaining 39 (30.95%) had late stages of cancer. STAGE 0 cancer refers to patients with carcinoma in-situ.

BAR GRAPH SHOWING DISTRIBUTION OF CANCER STAGES OF PATIENTS:



8) ORAL ANTICANCER DRUGS PRESCRIBED:

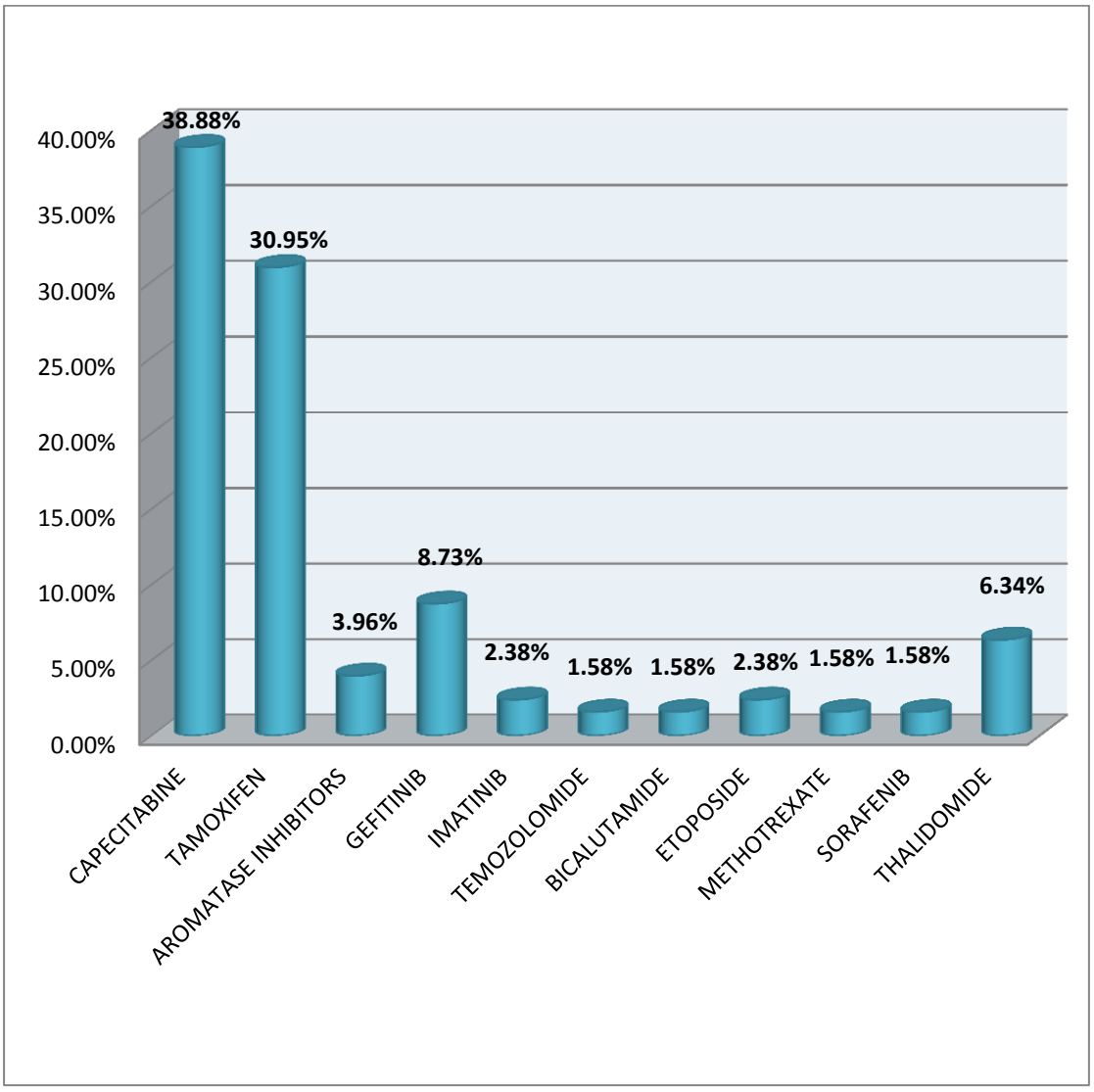
The different oral anticancer drugs prescribed are:

TABLE NO: 8

Drugs	Frequency(n)	Percentage
Capecitabine	49	38..88%
Tamoxifen	39	30.95%
Aromatase inhibitors	8	6.34%
Gefitinib	11	8.73%
Imatinib	3	2.38%
Temozolomide	2	1.58%
Bicalutamide	2	1.58%
Etoposide	3	2.38%
Methotrexate	2	1.58%
Sorafenib	2	1.58%
Thalidomide	5	3.96%
	N=126	

The drugs involved were Capecitabine 49(38.88%), tamoxifen 39(30.95%), gefitinib 11(8.73%), aromatase inhibitors 8(6.34%), thalidomide 5(3.96%), imatinib, etoposide 3(2.38%), temozolomide, bicalutamide, methotrexate, sorafenib 2(1.58%).

GRAPHICAL REPRESENTATION OF DISTRIBUTION ORAL ANTICANCER DRUGS PRESCRIBED:

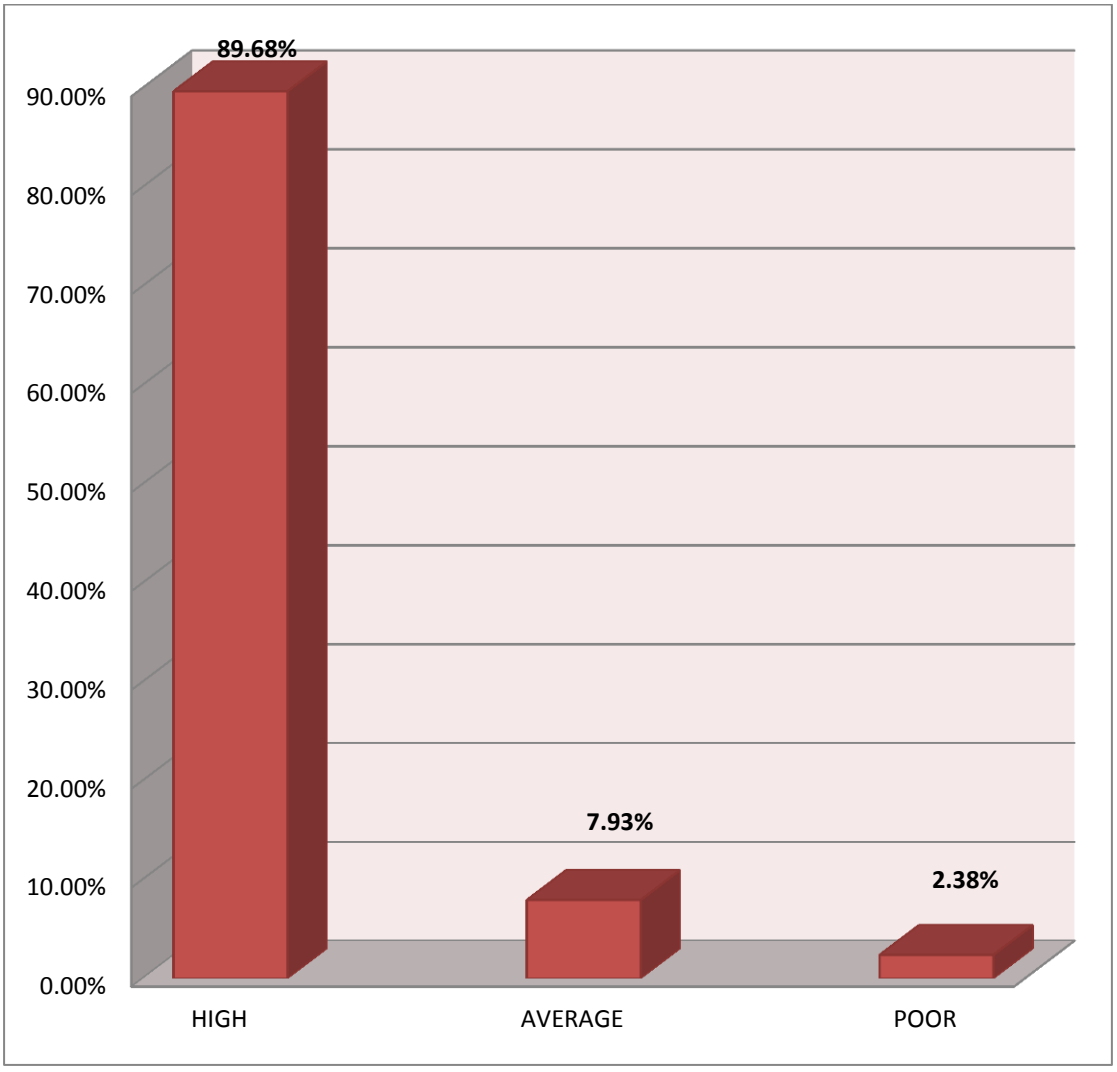


9) ADHERENCE:

The majority of the patients 113(89.68%) reported no difficulties in adherence to their oral anticancer treatment regimen, 10(7.93%) of the total population were medium adherent and 3(2.38%) of the patients were poorly adherent to their oral anticancer regimen.

Adherence	Frequency(n)	Percentage
High	113	89.68%
Medium	10	7.93%
Poor	3	2.38%
	N=126	100%

GRAPHICAL REPRESENTATION SHOWING ADHERENCE IN PATIENTS:



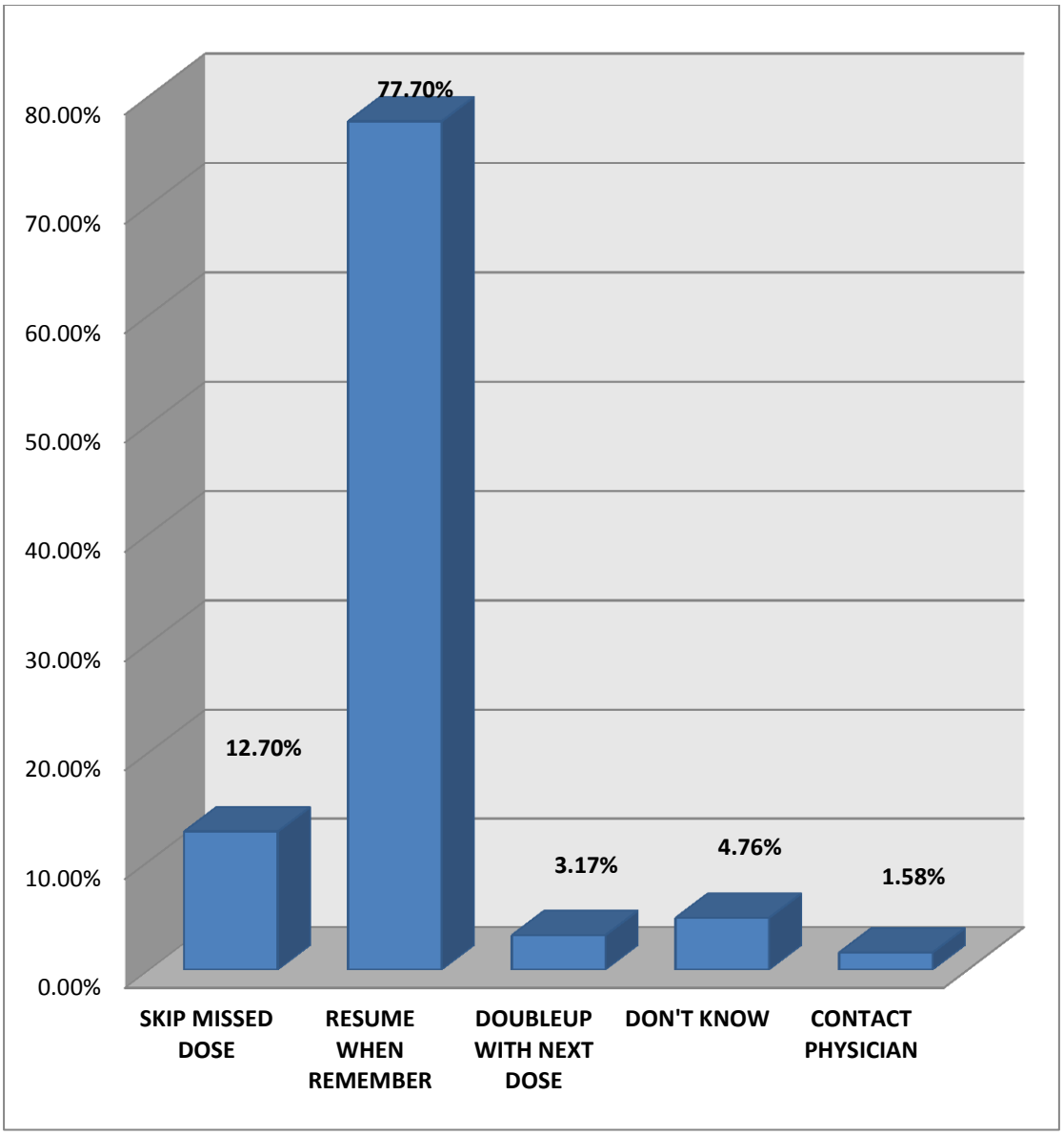
10) RESPONSE OF PATIENTS ON MISSED DOSE OF ORAL ANTICANCER:

TABLE NO:10

Action taken	Frequency(n)	Percentage
Skip missed doses	16	12.7%
Resume taking the dose when remember	98	77.77%
Double up with next dose	4	3.17%
Do not know	6	4.76%
Contact physician	2	1.58%
	n=126	100%

When asked what they would do if they missed a dose of their oral anticancer medicine, a variety of responses were given. Majority of the patients 98(77.77%) resume taking their doses when remember, 16(12.7%) patients skipped their missed doses, 6(4.76%) patients don't know what to do if a dose is missed, 4(3.17%) taken up their medication with their next dose, that is double up with next dose and 2(1.58%) patients were contact physician when missed a dose.

GRAPHICAL REPRESENTATION OF VARIOUS RESPONSE OF PATIENTS ON THEIR MISSED DOSE OF ORAL ANTICANCER DRUGS:



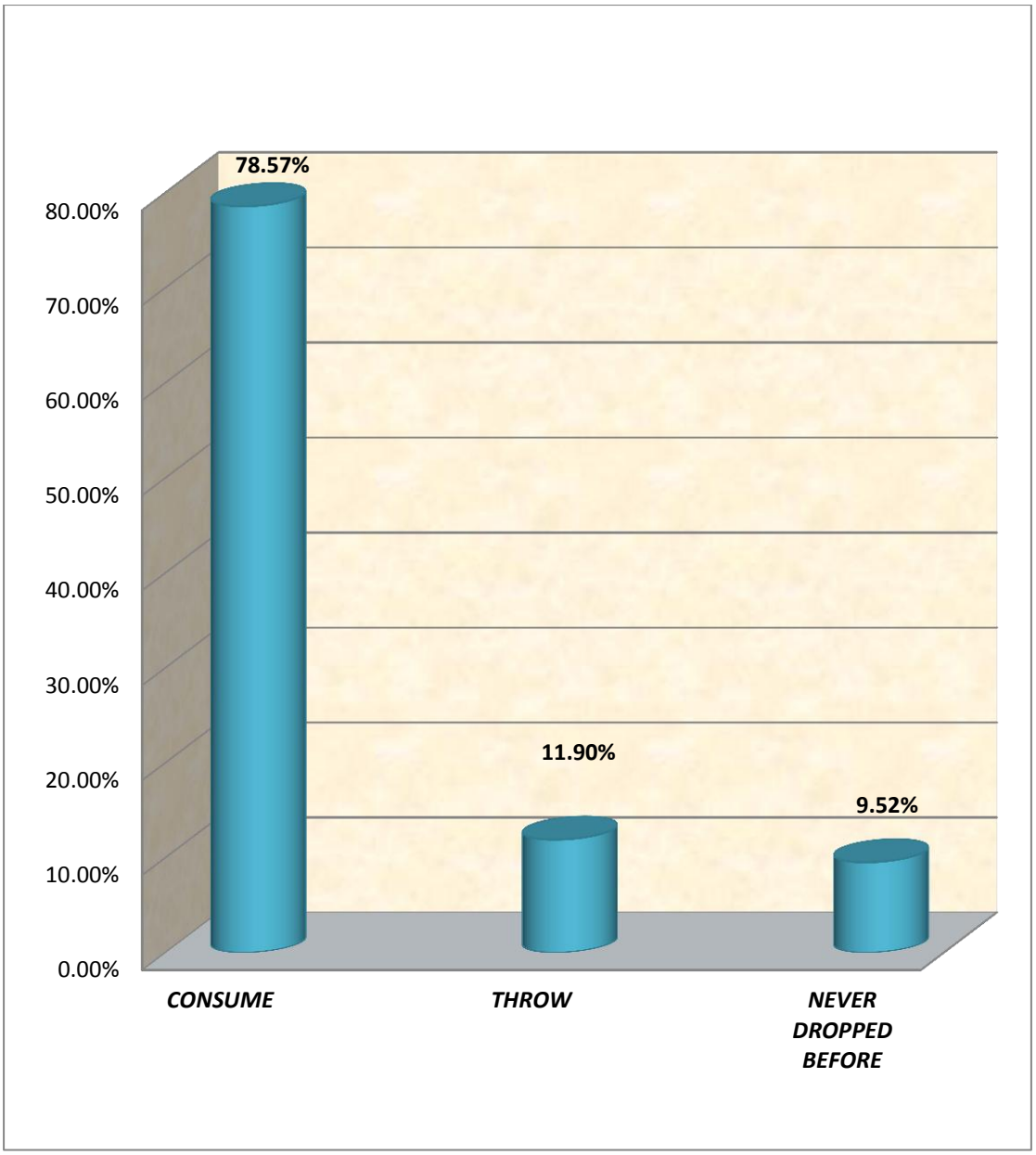
11) COURSE OF ACTION TAKEN BY PATIENTS IF A DOSE IS DROPPED ON THE FLOOR:

TABLE NO: 11

Action taken	Frequency(n)	Percentage
Consume	99	78.57%
Throw	15	11.9%
Never dropped before	12	9.52%
	N=126	100%

When asked how patients would treat their oral anticancer drugs that are dropped on the floor, the majority of the patients 99(78.57%) would pick up their medication with their medication with their fingers and consume. Only 15(11.9%)would throw their dropped medication into the bin regardless of location and 12(9.52%) insisted that they have never dropped their medication before and would therefore not want to consider the hypothetical situation.

GRAPHICAL REPRESENTATION SHOWING THE COURSE OF ACTION TAKEN BY THE PATIENTS WHEN ONE DOSE IS MISSED:



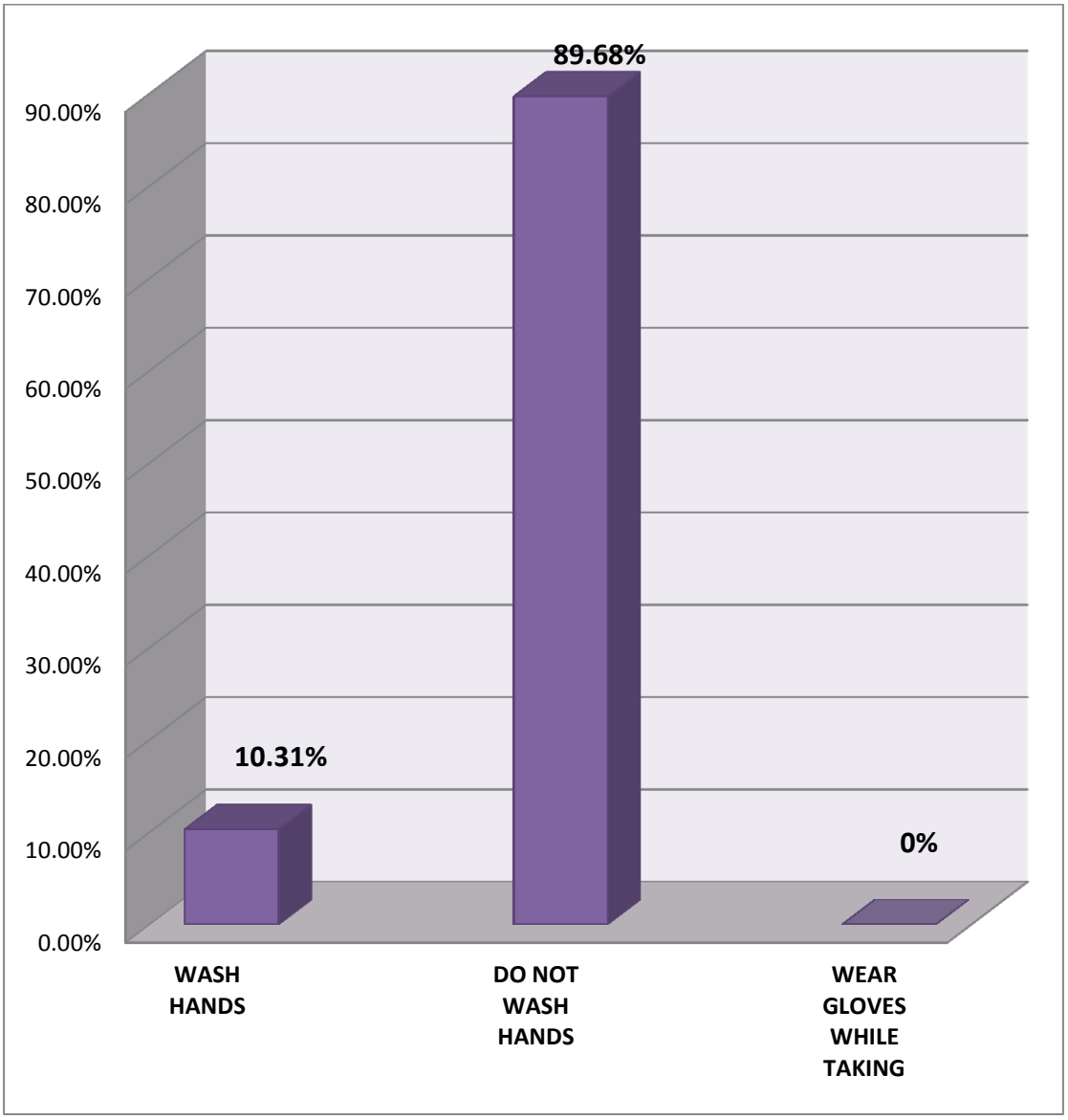
12) ACTION TAKEN, AFTER HANDLING THE ORAL ANTICANCER AGENTS:

TABLE NO: 12

Action taken	Frequency(n)	Percentage
Wash hands	13	10.31%
Do not wash hands	113	89.69%
Wear gloves while taking	0	0%

All the patients interviewed, indicated that they would not wear gloves when handling their oral anticancer agents. Majority of the patients 113(89.69%) responded that they do not wash their hands after handling their oral chemotherapeutic agents. Only 13(10.31%) would wash their hands. No one claimed that they would use alcohol or other agents to wipe their hands instead of washing.

GRAPHICAL REPRESENTATION OF COURSE ACTION BY THE PATIENTS AFTER HANDLING THE ORAL CHEMOTHERAPEUTIC AGENTS:



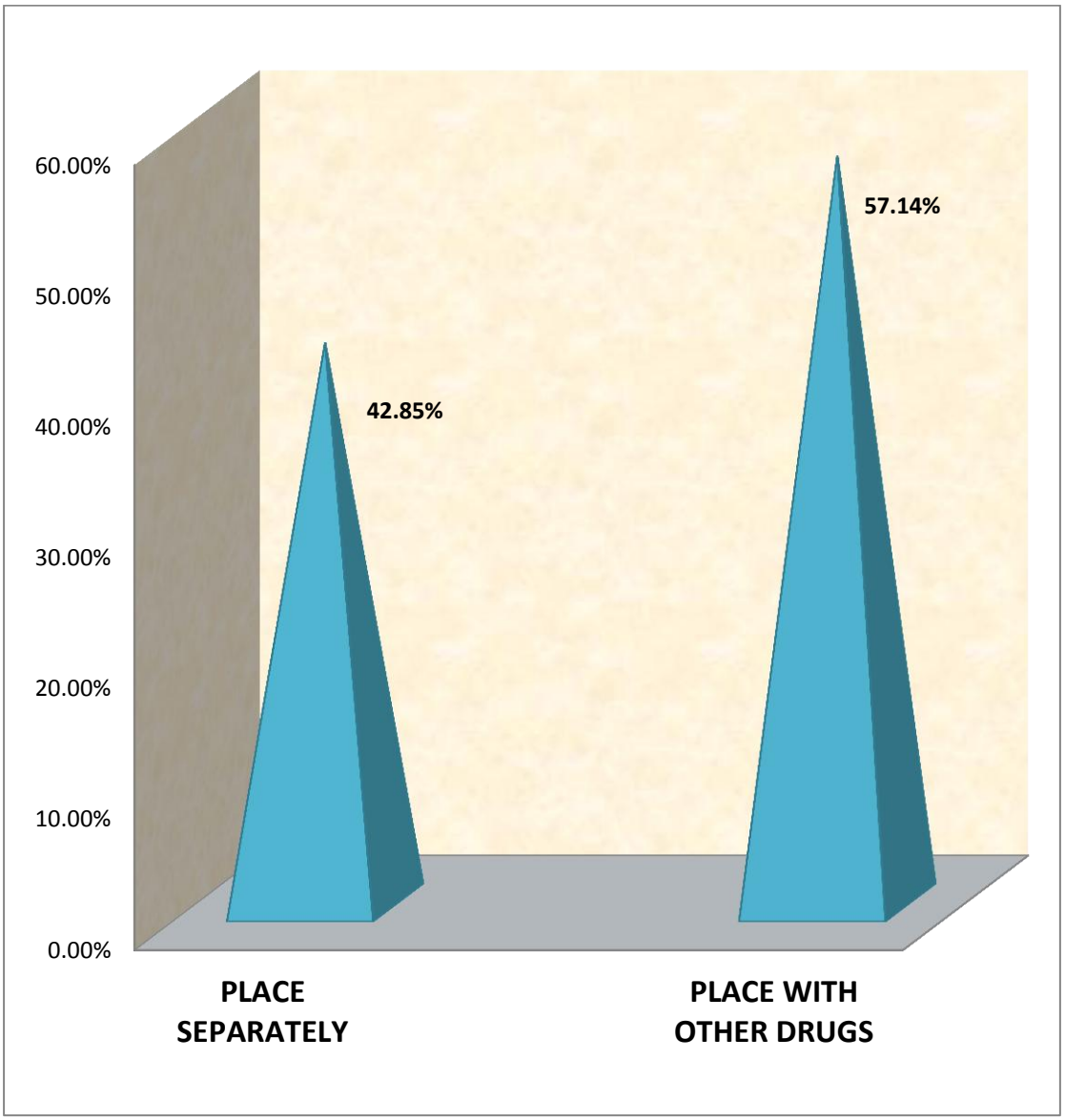
13) STORAGE:

TABLE NO:13

Storage	Frequency(n)	Percentage
Place separately	59	46.82%
Place with other drugs	67	53.17%
	N=126	100%

More than half, 67(53.17%) claimed that they would store their oral anticancer agents with other drugs. Rest of the patients store their anticancer drugs separately from other medications.

GRAPHICAL REPRESENTATION SHOWING THE STORAGE OF ORAL ANTICANCER AGENTS:



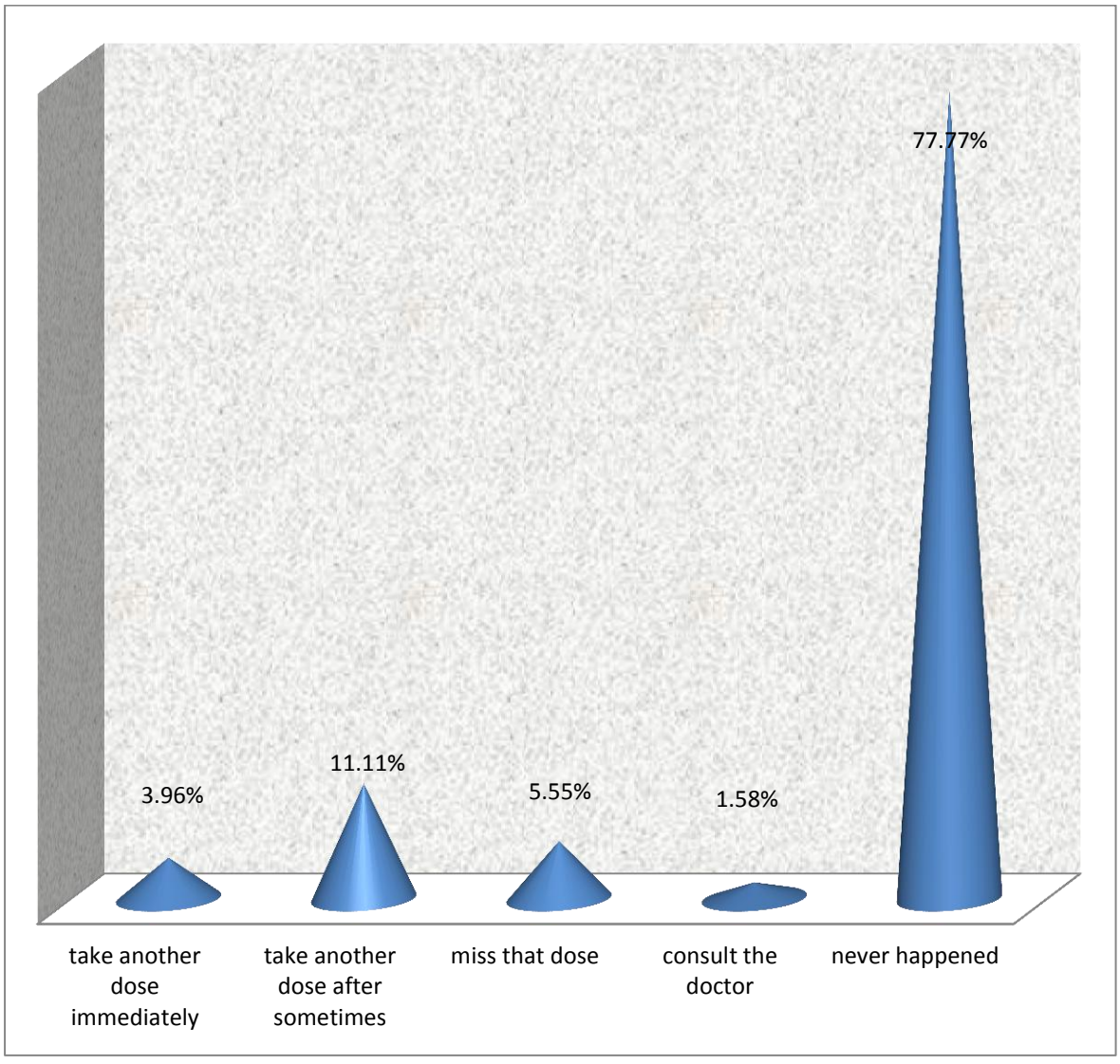
14) RESPONSE TO POST DOSE VOMITING:

Table no:14

Action taken	Frequency(n)	Percentage
Take another dose immediately	5	3.96%
Take another dose after sometimes	14	11.11%
Miss that dose	7	5.55%
Consult the doctor	2	1.58%
Never happened	98	77.77%
	N=126	100%

When asked how the patients would response to the post dose vomiting condition, 98(77.77%) had never happened the situation. 14(11.11%) take another dose after sometimes, 7(5.55%)miss that dose and 5(3.96%) take another dose immediately after vomiting. Only 2(1.58%) consult the doctor for further clarification.

GRAPHICAL REPRESENTATION SHOWING THE RESPONSE TO POST DOSE VOMITING:



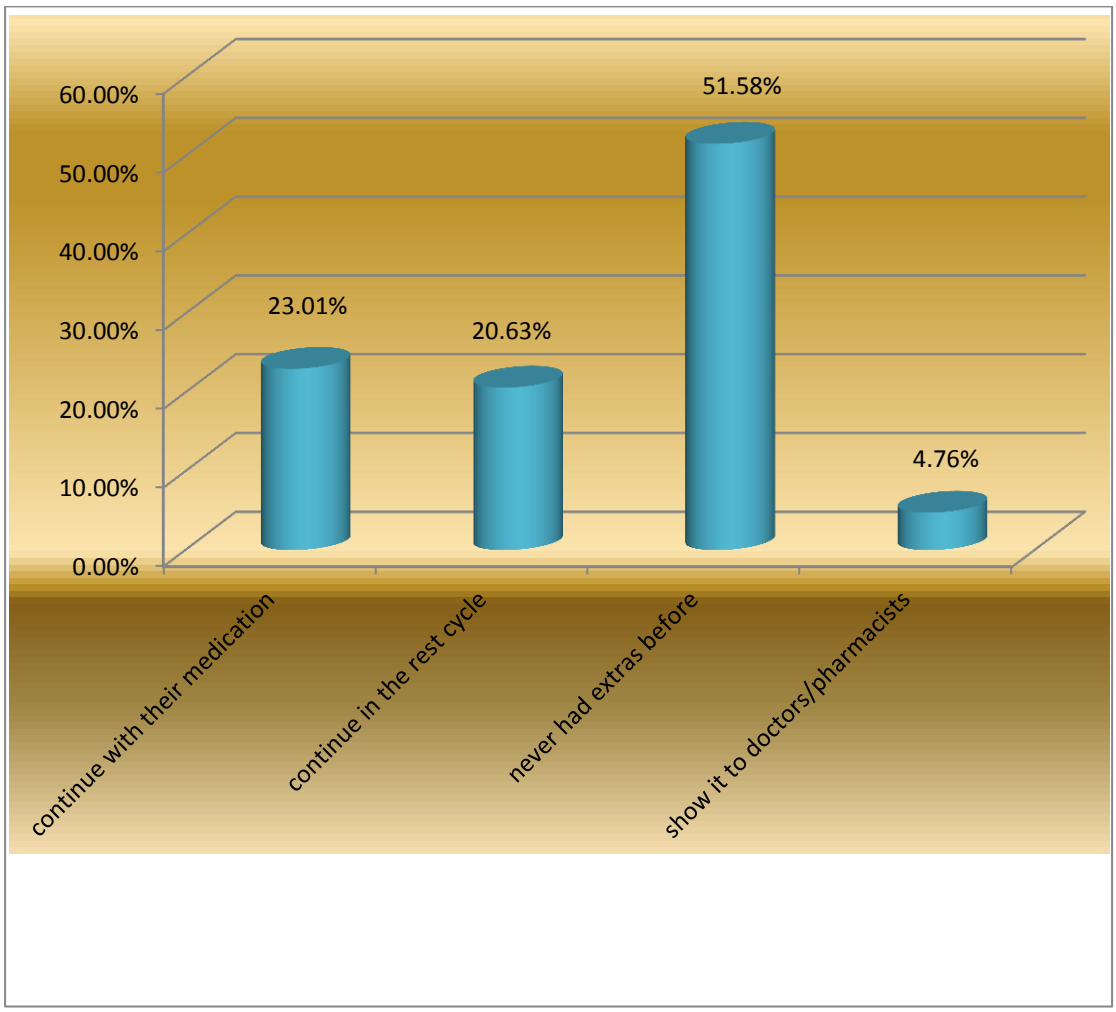
15) HANDLING OF LEFTOVER MEDICATION:

Table no:15

ACTION TAKEN	FREQUENCY(n)	PERCENTAGE
Would continue with their medication	29	23.01%
Would continue in the rest period of cycle	26	20.63%
Never had extras before	65	51.58%
Show the extra medication to doctors/pharmacists	6	4.76%
	n=126	100%

When asked what they would do with leftover medication before the next appointment or refill, more than half 65(51.58%) never had extras before and 29(23.01%) would continue their medication, 26(20.63%) claimed that they would continue in the rest period of the cycle. Only 6(4.76%) indicated that they would tell or show the extra medication to their doctors or pharmacists.

GRAPHICAL REPRESENTATION SHOWINGHANDLING OF LEFTOVER MEDICATION:



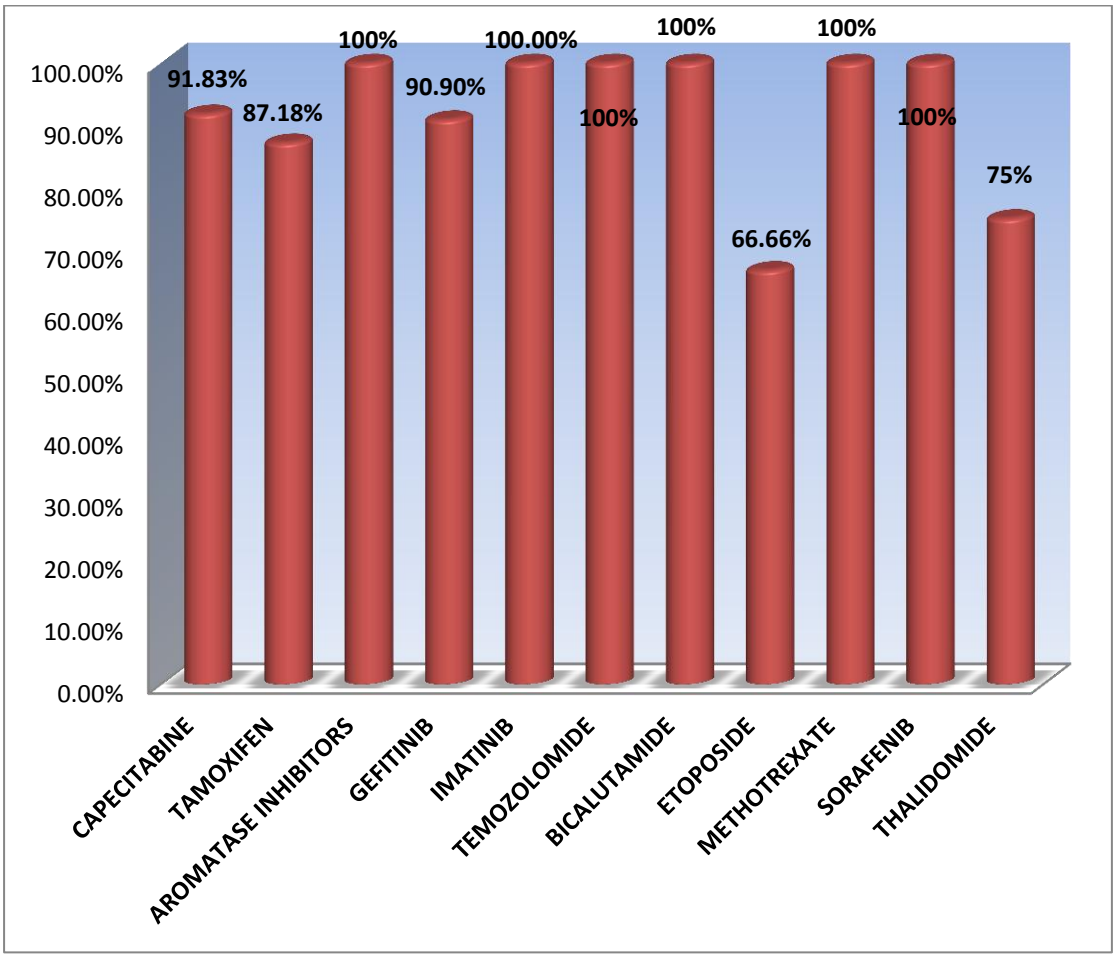
16) ADHERENCE (HIGH) ON DIFFERENT ANTICANCER DRUGS:

TABLE NO:16

Drugs	Frequency(n)	percentage
Capecitabine	45/49	91.83%
Tamoxifen	34/39	87.18%
Aromatase inhibitors	5/5	100%
Gefitinib	10/11	90.90%
Imatinib	3/3	100%
Temozolomide	2/2	100%
Bicalutamide	2/2	100%
Etoposide	2/3	66.66%
Methotrexate	2/2	100%
Sorafenib	2/2	100%
Thalidomide	6/8	75%

Majority of the patients were on capecitabine and the adherence rate was found to be 45 of 49(91.83%), in case of tamoxifen the adherence was 34 of 39(87.18%). Adherence in case of gefitinib is 10 of 11(90.9%), etoposide 2 of 3(66.66%), thalidomide 6 of 8(75%). Aromatase inhibitor, imatinib, temozolomide, bicalutamide, methotrexate and sorafenib have 100% of adherence because only less number(5 or less than 5) of the patients were on these tablets.

GRAPHICAL REPRESENTATION OF ADHERENCE (HIGH) ON DIFFERENT ANTICANCER AGENTS:



PATIENTS' DEMOGRAPHICS:

Among 126 subjects, majority are female patients 70(55.55%) and 56(44.44%) male patients. More than half 111(88.09%) having only secondary school education or less. 35(27.7%) of patients were alcoholics, 21(16.66%) were smokers and 4(3.17%) of patients were tobacco users. The mean age of the patients were about 60 years old and the majority of the patients falling in the range of 45-74 years old.

DOSING AND COMPLIANCE:

Most of the patients administered their own oral anticancer agent and only few were administered by the caregiver. The majority of the patients 113(89.68%) expressed that their treatment regimens were simple to adhere , 10(7.93%) of the patients were medium adherent and 3(2.38%) of the patients were poorly adherent to their oral anticancer regimen. The majority of the drugs prescribed were Capecitabine 49(38.88%), tamoxifen 39(30.95%), gefitinib 11(8.73%), aromatase inhibitors 8(6.34%), thalidomide 5(3.96%), imatinib, etoposide 3(2.38%) and temozolomide, bicalutamide, methotrexate and sorafenib 2(1.58%).

STORAGE AND HANDLING:

More than half of the total population, 67(53.17%) claimed that they would store the oral anticancer agents with the other drugs. Hand washing habit after handling the oral anticancer agents was not a common habit reported by studied subjects. Only 13(10.31%) claimed that they habitually wash their hands after handling oral anticancer drugs. Only 15(11.9%) patients would throw their dropped medication into the bin. Most of the patients 99(78.5%) would pick up their medication with their fingers and consume, though 12(9.52) insisted that they have never dropped their medication before. Majority of the patients 98(77.77%) resume taking their doses when remember, if they missed one dose of oral anticancer medication, 16(12.7%) skipped the missed dose and 4(3.17%) double up with the next dose.

SUGGESTION:

Patient Education & Information for safe handling of oral anticancer agents:

- Before every treatment cycle, all patients should be seen by a specialist pharmacist or nurse. The pharmacist/technician handing the drugs to the patient (or relative or carer) must ensure that they fully understand :-
- How and when to take their medicines. Some patients may find it particularly hard to remember the idea of repeated short courses of treatment with 'gaps' between them
- What to do in the event of missing one or more doses
- What to do in case of vomiting after taking a dose
- Likely adverse effects and what to do about them
- Principles of safe handling, storage and disposal
- That if used, medicine spoons or measures should be disposable and used once only.
- Arrangements for monitoring
- Contact details for specialist advice
- Keep the medication in the container in which it was supplied with the dispensing labels.
- Patients should receive verbal and written information about their oral anticancer medication from the initiating hospital, including details of the intended regimen and treatment plan, taken from the original protocol.

INFORMATION FOR PATIENTS (COUNSELLING POINTS):

- **Missed dose:** If you forget one dose, do not take a double dose in one day to make up for a missed dose. If remember 30 to 90 minutes after they should have taken their tablets, then take the missed dose; if it is near to the time when their next dose is due, do not take missed dose. Inform doctor/ chemotherapy unit and keep to normal dosing schedule.

- **Post dose vomiting:** Do not take an extra capsule without consulting your doctor. Anti-emetics should be given before and during therapy to reduce nausea and vomiting.

- **Disposal of medication:** If your doctor decides to stop the treatment, return any remaining tablets to the pharmacist to be disposed of in a manner appropriate for disposal of cytotoxic & cytostatic medicines.

- **Advice for patients:**

    - Capsules should be swallowed whole, not chewed.
    - Patients should not breast feed whilst taking oral anticancer agents
    - Tablets should not be divided. There is no risk in handling tablets provided outer coating on the tablets is intact.
    - Most of the tablets are provided with the outer coating which is intact, there is no risk in handling.
    - Do not open blister if there is evidence of capsule leakage. Urine and faeces produced for up to 4 and 7 days, respectively after a dose should be handled wearing protective clothing.
    - The contents of capsules should not be inhaled or allowed to come into contact with the skin or mucous membranes.
    - If accidental contact with powder from capsule into the eye, skin or mucosa, immediately rise with water and seek medical attention.
    - Intact capsules should be swallowed whole with water, not sucked, bitten or chewed.
    - Do not break or chew the capsules.
    - Wash hands immediately after handling/halving tablets, avoid contact with eyes and inhalation of particles.
    - Use of protective gloves to dispense oral hazardous drugs is recommended.
    - Hands must be washed thoroughly after each dispensing
    - Urine and faeces produced for up to 48 hours and 5 days, respectively after a dose should be handled wearing protective clothing.

Dos for Oral Chemotherapy	Don'ts for Oral Chemotherapy
On receiving your prescription, review the package label, specifically checking medication name and dosage.	Leave medication in open areas, near sources of water, direct sunlight, or where they can be accessed by children or pets.
Ensure that you completely understand when and how to take the medication and ask questions if there is any confusion.	Store medications in the areas where food or drinks are stored or consumed.
Transport and store medicine as instructed and as outlined in the packaging label.	Crush, break, or chew tablets.
Use gloves if possible and wash hands thoroughly before and after glove application. If gloves are not worn, tip tablets and capsules from their container/blister pack directly into a disposable medicine cup.	Double-up on doses, unless instructed by a health care professional.
Administer the medication as instructed.	Share prescriptions or medication.
Keep a journal of adverse effects. Make a list of adverse effects for which the health care professional has to be contacted immediately.	Assume that oral chemotherapy is safer than intravenous chemotherapy.
Consider using adherence devices. Use separate devices for cytotoxic and noncytotoxic agents.	Skip doses unless instructed by your physician.
Report any overdosing immediately.	Discard medication down the toilet or in the garbage.
	Keep information ready for necessary action in the event of accidental exposure (including emesis and accidental ingestion).

	Return wet, damaged, unused, discontinued, or expired medications to the pharmacist or hospital for disposal.
	Report all medications (prescription and nonprescription as well as complementary and alternative medicines) and any specific dietary requirements to the health care provider/prescriber, at the time of assessment and consultation. Inform other health care professionals that you are on oral chemotherapy (eg, surgeons and dentists).
	Minimize the number of individuals coming in contact with the cytotoxic medications.
	Wash the patient's clothes and bed linen separately from other items.

It is recommended that caregivers wear gloves at all times while handling oral chemotherapeutic agents as well as contaminated items in order to minimize risk of exposure.

Oral agents are expected to represent up to 25% of all drug used for treatment of cancer in the upcoming decade. As oral anti cancer agents are gaining much popularity worldwide, this study is timely because it has highlighted numerous aspects regarding oral anticancer drugs. In this study the majority of the patients had received only one oral drug, they are usually given along with parenteral agents. In this study over 89.68% of the surveyed patients claimed that they are adherent with their oral anti canc er drugs. In an article written by O'Neill et al., the authors stated that there was a tendency for reductions in compliance among cancer patients during chronic treatment. However this study was not designed to study adherence over long- term use. Multiple strategies are available to access patients' adherence to medications, but none of this strategies is considered to be the golden standard. In this study, patient questionnaires were administered to access patients' adherence to oral anti cancer drugs. This method is regarded to be the simplest method in the clinical setting.

Evidently there is a need to educate patients on the importance to handle oral anti cancer drugs appropriately. .Patients generally seemed have no problems with understanding and adhering to their anticancer treatment regimen. However, their varied responses to a missed dose suggest that patients are too complacent with their medication habits . Patients handling practices with their oral anti cancer agents also showed their lack of knowledge in this area as well as lack of understanding about the nature of the medicine. The oral anti cancer agents were regarded patients as any other ordinary medicine as shown when more than half (78.57%) would pick up and consume their dropped medication. Most patients admitted that hand washing after handling oral anti cancer drugs was not their routine practice; hand washing and appropriate gloving are recommended when handling oral cytotoxics such as etoposide. There is no clear guideline for handling a number of agents, for example, imatininib, gefitinib, erlotinib, and others of similar pharmacological classes. It would appear prudent to adopt these practices, but the literature for health professionals as well as patients has been inconclusive. O ne limitation of this study is the lack of assessment of health care professionals' perceptions of oral anticancer drugs. Health care professionals' views are important as many institutions are developing standard policies to strengthen patient education about safe hand ling of

oral anticancer drugs. In order to ensure quality education programs can be designed to improve patients' understanding as well as safe use of oral anticancer agents, health care professionals should also have a good understanding on safe handling of oral anticancer agents. Availability of oral anticancer agents with novel mechanisms of action has brought new hopes to the treatment of cancer. However, new issues rise simultaneously and these issues require attention. Healthcare professionals, including oncologists, oncology nurses, as well as oncology pharmacists must play active roles to facilitate patients in assuming more responsibility to manage their oral anticancer drugs. Improved communication may assist to improve patients' treatment outcomes and to prevent detrimental events.

Patients clearly need to be educated about the nature of their medications, particularly on how they should handle and their practices with their medication appropriately. Though all patients are educated on how to take their oral anti-cancer agents and the course of action in the event of a missed dose, more can definitely be done to reinforce their knowledge. The majority of patients receiving oral anticancer agents reported no difficulty in adhering to their oral anticancer regimens as prescribed. However, this study demonstrated the need to improve patients' understanding of the requirements for storage, handling, and safe administration of oral anti cancer drugs.

Healthcare professionals could also play a more active role in educating their patients to allow patients to assume appropriate responsibility in managing their condition and medication.

Among various diseases, cancer has become a big threat to human beings globally. As per Indian population census data, the rate of mortality due to cancer in India was high and alarming with about 806000 existing cases by the end of the last century. Cancer is the second most common disease in India responsible for maximum mortality with about 0.3 million deaths per year. This is owing to the poor availability of prevention, diagnosis and treatment of the disease. All types of cancers have bee n reported in Indian population including the cancers of skin, lungs, breast, rectum, stomach, prostate, liver, cervix, esophagus, bladder, blood, mouth etc. The causes of such high incidence rates of these cancers may be both internal (genetic, mutations, hormonal, poor immune conditions) and external or environmental factors (food habits, industrialization, over growth of population, social etc.).

Over the past decade, there is an observed paradigm shift in cancer treatment, moving from parenteral to oral anticancer drug administration as a number of oral anticancer agents are now widely used worldwide. In comparison to intravenous anticancer treatments, administration of anticancer therapy orally is appealing because it offers great convenience and flexibility in terms of timing and location of drug ad ministration. However, this also implies that patients must assume greater responsibilities for their treatment, with regards to adherence and safe handling of their oral anticancer drugs.

With the rise in availability and increasing use of oral anticancer agents, concerns about adherence to prescribed regimens will become an increasingly important issue in oncology. In view of an increased usage of oral anticancer drugs in the contemporar y treatment of cancer this study aimed to measure the adherence of oral anticancer drugs and patients behavior regarding storage and handling of oral anti cancer drugs.

This was a single centre, cross sectional, interviewer administered study carried out by applying a structured interview to cancer patients who were on oral anti cancer medication. For checking the adherence Morisky's 8-item questionnaire were used, the adherence was measured by giving score to each question, if the score is 0, cons idered as high adherent, 1 or 2 average adherence and >2 poor adherence. In this

study, more than half of the patients (89.68%) responded high adherence. In this study the majority of the patients were gastrointestinal cancer patients (38.88 %), and breas t cancer (33.33 %). The adherence rates in different drug were found to be as, capecitabine (91.83%), tamoxifen (87.18%), gefitinib
(90.9%) and thalidomide (75%).

Hand washing after handling oral anticancer agents was not a common habit reported by study subjects, only 13 (10.31%) claimed that they habitually wash their hands after handling oral anticancer drugs. When asked how patients would treat their oral anticancer drugs that are dropped on the floor, 99 (78.57 %) indicated that they would picked up and consume it, 15 (11.9 %) would refuse to take and dispose it immediately. However, when asked what they would do if they a missed a dose of their anticancer medicine, a variety of responses were given. Majority of the patients 98 (77.77%) resume taking the doses when remember, 16 (12.7%) skipped their doses and 4 (3.17 %) double up their doses with next dose.

It may be concluded that the study "patients' adherence, practices and behavior regarding the oral anticancer drugs" was found to be effective in monitoring adherence, behavior regarding handling and storage of their oral anticancer medication.

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